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CHINESE TACTICAL NUCLEAR WEAPONS

by

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The United States, Russia and Great Britain have retired all nonstrategic nuclear weapons. Surprisingly, China has not. China seems to value highly tactical nuclear weapons (TNWs). Most studies of China's nuclear arsenal focus on strategic nuclear weapons. This focus could mislead those trying to understand PRC TNW strategy. The purpose of this thesis is to explain China's TNW development.

China's nuclear arsenal evolution can be described in three phases. In the first phase, China developed a limited strategic nuclear deterrent. China's arsenal was driven by threat. Technology supplanted threat as the dominant driver during the next phase. While conducting research to miniaturize strategic warheads, TNWs were developed. During the third phase, a reduced threat caused political leaders to restrain the nuclear program. The nuclear program reverted to its primary objective — building strategic weapons, causing TNW production to level off. This study explains the last two phases of TNW development.

The research goals are twofold: to compare threat and technology, the primary motivations driving TNW production; and to examine the relationship between doctrine and development, describing how one influences the other. The conclusion offers U.S. foreign policy recommendations.

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CHINESE TACTICAL NUCLEAR WEAPONS

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ABSTRACT

The United States, Russia and Great Britain have retired all nonstrategic nuclear weapons. Surprisingly, China has not. China seems to value highly tactical nuclear weapons (TNWs). Most studies of China's nuclear arsenal focus on strategic nuclear weapons. This focus could mislead those trying to understand PRC TNW strategy. The purpose of this thesis is to explain China's TNW development.

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EXECUTIVE SUMMARY

A. PURPOSE

In 1991 the United States, Russia and Great Britain removed all nonstrategic nuclear weapons from active service. Surprisingly, China did not follow suit. Tactical nuclear weapons (TNWs) seem to be as important to China as ever. Most studies of China's nuclear arsenal focus on strategic nuclear weapons strategy. This focus could mislead those attempting to understand PRC TNW strategy. The purpose of this thesis is to explain TNW development in China through different periods.

B. GOALS

The goals of this research project are twofold. First, this thesis identifies and compares the primary motivations which drove TNW production — threat and technology. In this thesis, the dominant motivator is linked with each phase of TNW development. Second, this thesis examines the relationship between doctrine and development, describing how one influences the other during each phase of analysis.

C. HYPOTHESES

This research probes Chinese motivations for developing TNWs. In particular, this study examines the role of doctrine (driven by threat perceptions) and technology as influencing factors. This thesis explores an aspect of PRC strategic planning by identifying and examining the causal relationship between nuclear doctrine and arsenal development. Two competing hypotheses are tested to understand TNW development.

Certain factors influence the development of a nation's nuclear arsenal. The first hypothesis states that doctrine drives development. Perceptions of external threat lead political leaders to develop security-based national strategies. Military strategists develop doctrines of security which support these national security

strategies. The industrial infrastructure builds defense systems following programs planned by military strategists. According to this classic notion of development, arsenal design responds to leadership perceptions of threat.

However, this fails to explain the initial building of TNWs. A competing supposition better explains the emergence of PRC TNW evolution. It posits that other means, specifically technology, drove development. The findings of this research detail which driver is dominant during each phase of PRC TNW development.

D. FINDINGS

The evolution of China's nuclear arsenal can be described in three phases. During the early 1960s, China developed strategic nuclear weapons to deter enemies. China's arsenal was driven by threat. Technology supplanted threat as the dominant driver during the next phase. While conducting research to miniaturize strategic warheads, TNWs were developed. During the third phase, political leaders discerned a reduction in the threat environment. Resources that were allocated liberally to the nuclear program during the previous phase were reduced. The nuclear program reverted to its primary objective of building strategic weapons, leaving TNW production to level off. This thesis studies development during these last two phases to explain TNW development.

E. IMPLICATIONS

The thesis challenges the notion that security doctrine solely drives weapons development by examining the Chinese nuclear program. This research provides a case study of nuclear strategic planning for comparison with the other nuclear powers. Additionally, this study shows the effects of two competing factors in the development of China's TNW arsenal. By understanding the operational components of this medium nuclear power, the strategic planner can forecast more accurately future Sino-American interaction.

The trend in Chinese force development is an implicit derivative of this research. The ramifications of the aforementioned research findings are important to U.S. foreign policy. Therefore, the following recommendations are offered:

1. *Continue arms control and disarmament efforts.* These could lead to further reductions in TNW levels. The pressures for reduction in nuclear arsenals and for prevention of the spread of nuclear weapons technology to non-nuclear weapon states are growing. It appears that China feels this pressure and is changing its defense industry. However, it is likely that China will not be limited by technology significantly due to the conversion of the defense industry. The facilities which produce military armaments continue to manufacture weapon systems; therefore, if the focus returns to nuclear weapons, TNW systems can be expected to be more advanced than those currently fielded.

2. *Remain Engaged.* The emphasis on engaging China politically, militarily, and economically reduces PRC perceptions of a threat from the United States. Lower threats, coupled with political stability, appear to have a mediating effect on TNW production. We can expect to see fewer weapons due to attrition and low production if this stance is maintained.

3. *Resolve the Taiwan issue.* Communicating support, tacitly or explicitly, for a Taiwanese independence movement could trigger a return to TNW production. TNWs have great military utility in this type of skirmish. The PRC considers the use of TNWs on its own territory not a violation of the "no first use" policy. Additionally, if this hypothetical independence movement is backed by the United States, the use of TNWs would be essential to leveling the gap in technology between these military forces. In the future, enhanced economic resources and increased technological capability may enable the PRC to field an advanced TNW arsenal. Therefore, the immediate resolution of this issue is necessary.

I. INTRODUCTION

A. BACKGROUND

The People's Republic of China (PRC) is one of five declared nuclear weapons states.[1] Today China possesses the world's fourth largest nuclear arsenal.[2] Its nuclear program differs from the other two medium nuclear powers — Great Britain and France — in both composition of weaponry and overall destructive potential.[3] The scope of the program is remarkable considering its rocky beginning.

China's nuclear aspirations began as a search for identity and prestige. Despite economic and resource limitations, China chose to develop a costly nuclear arsenal. Throughout the Cold War, China's relations with the superpowers changed dramatically. Consequently, the primary threats to China's security changed. China's nuclear doctrine developed into an Asian variant of deterrence, which in turn caused the superpowers to alter their strategies. Several studies have explored the development of strategic nuclear weapons in China; however, relatively few have examined Chinese tactical nuclear weapons (TNWs).[4] As the Chinese nuclear arsenal

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[1] The five declared nuclear weapon states are the United States, Russia (former USSR), Great Britain, France, and China. The term declared nuclear weapon state means that each country manufactured and exploded a nuclear weapon or other nuclear device before January 1, 1967. See the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT), Article IX.

[2] Robert Norris, Andrew Burrows, and Richard Fieldhouse, Nuclear Weapons Databook, vol. 5, British, French, and Chinese Nuclear Weapons (Boulder: Westview, 1994), 8.

[3] Great Britain and France structure nuclear arsenals to attack adversaries using long range strikes. To accomplish this mission, weapons are lighter and the systems are more versatile. China maintains fewer weapons, but they have high destructive potential. See T. Terrif and I. H. Daalden, "Introduction," Arms Control Today 14, no. 4 (April 1993): 1-4; and Norris, Nuclear Weapons Databook, 8.

[4] PRC TNWs are those systems with low ranges and low yields, which are intended to be used within Chinese territory. The TNW systems examined in this study belong to three groups: bombers, missiles and mines. Aircraft with tactical roles include the Bu-5, Bu-6, and Qian-5. The M-family of missiles with nuclear capabilities are M-9/DF-15, M-11, and possibly the M-7, and M-18. Atomic demolition mines and enhanced radiation weapons are the final category. See TNW definition in Chapter II.

developed, PRC strategy leaned toward warfighting and away from Western-style minimum deterrence.[5] This transformation makes the role of TNWs important.

There are three notable features of the Chinese nuclear program that must be explained. One puzzling feature of this arsenal, when compared to other states, is its diverse composition of weaponry. Like Great Britain and France, China has chosen to incorporate a high percentage of battlefield nuclear weapons into its arsenal of strategic weapons and delivery systems.[6] More than thirty percent of Chinese nuclear weapons are tactical.[7] A second notable feature of this arsenal is the continuity of its tactical component. In September 1991 the United States, Soviet Union, and Great Britain decided to eliminate TNWs. They removed all non-strategic weapons from ships and submarines. Despite conducting exercises involving the use of TNWs, the Chinese have not officially acknowledged possession of these weapons. Also, they fail to justify maintaining TNWs when their adversaries have eliminated these weapons.[8] Finally, Chinese nuclear strategy is uniquely independent. Unlike the other medium nuclear powers whose nuclear policies are closely linked with those of the United States, China's nuclear strategy is ardently independent.[9]

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[5] China's stockpile of deployable systems and warheads exceeds the requirement for minimum deterrence strategy in level (200-250) and variety (a spectrum from strategic to tactical nuclear weapons). The development of TNWs runs contrary to the principles of minimum deterrence... [towards] counter-value, nuclear war-fighting. J. Mohan Malik, "Chinese Debate on Military Strategy: Trends and Portents," Journal of Northeast Asian Studies 9, no. 2 (Summer 1990), 21-23.

[6] Battlefield nuclear weapons and TNWs are used synonymously. Each term is characterized by low nuclear yields and short ranges. Specific weapon systems are categorized in the next chapter. David Robertson, Guide to Modern Defense and Strategy (London: Europa Publications, 1987), 37-8.

[7] Norris, Nuclear Weapons Databook, Table 1.7, p. 11.

[8] J. Mohan Malik, and others believe that the Chinese possess TNWs. It is possible that the Chinese view non-strategic weapon systems differently than the United States, former Soviet Union and Great Britain. These differences are explored later. J. Mohan Malik, "China Policy Towards Nuclear Arms Control in the Post Cold War Era," Contemporary Security Policy, 16, no. 2 (August 1995): 36.

[9] France's nuclear strategy was delinked from the NATO alliance in 1966; however, it was likely that the French would respond to an Eastern Bloc invasion into Germany with strategic force, as would NATO. The PRC is not a member of any alliance with nuclear-use connotations.

Why did the Chinese develop their tactical nuclear arsenal in this manner? This study seeks to explain the unique features of China's nuclear program by investigating the motives behind the arsenal's development. This thesis analyzes shifts in the Chinese arsenal development between 1972-79 and 1983-93. See Figure 1-1. Critical turning points in TNW development fall within these periods. The Chinese arsenal has been under development since 1955, when Mao Zedong stated the need for an independent nuclear weapon capability.[10] However, the Chinese did not build TNWs until approximately twenty years later.[11] Less than two decades after producing roughly 150 TNWs,[12] PRC leaders halted further TNW production.[13]

Many factors influence the evolution of China's nuclear weapons program. I focus only on the two most significant — security and technology. Other factors also influence the development of a country's national defense. For example, the organizational process, domestic structures, and national ethos help to design national security. This study delimits the universe of possible drivers to those factors which are most important. This restriction of independent variables makes the research task more practical.

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[10] This date has been argued by many. The consensus ranges from 1955-58. See Chong-Pin Lin, China's Nuclear Weapons Strategy (Lexington, Mass.: Lexington Books, 1988), 44; and Norris, Nuclear Weapons Databook, 327.

[11] Chong-Pin Lin, China's Nuclear Weapons Strategy, 78-81.

[12] The exact size and composition of China's nuclear arsenal is closely held by the PRC. Nevertheless, several sources have attempted to define the types and size of this arsenal. Norris predicts that the TNW component of the PRC arsenal will remain relatively constant for the foreseeable future. See Norris, Nuclear Weapons Databook, 8.

[13] Open source data on the exact cessation of TNW production is uncertain. See Norris, Nuclear Weapons Databook, Table 7.1, p. 359.

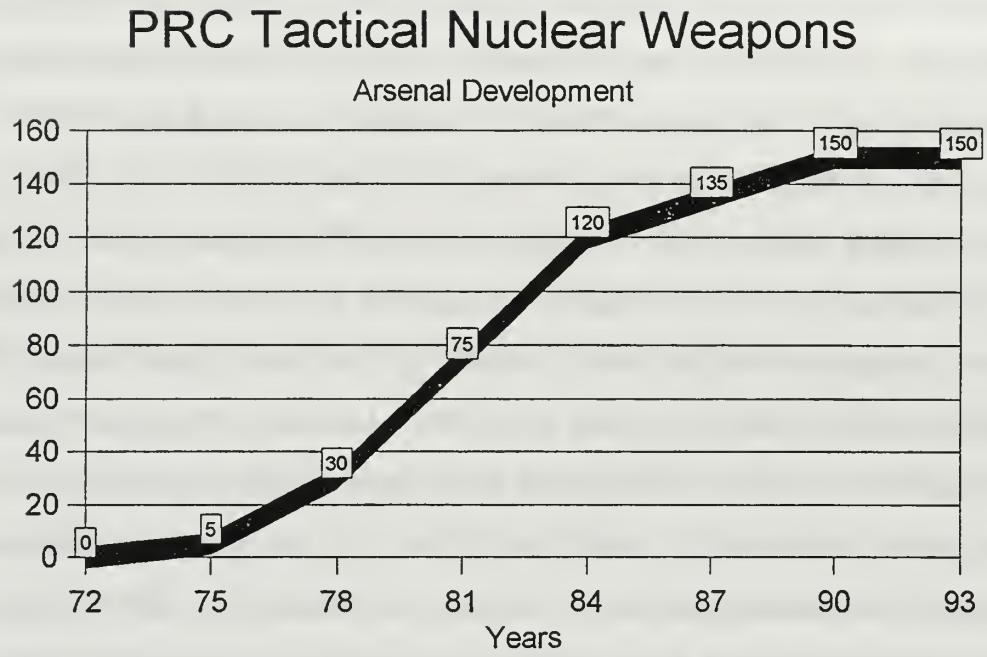

Figure 1.1. Tactical Nuclear Weapon Development

Source: Norris, Nuclear Weapons Databook, Table 7.1, p. 359.

B. PURPOSE

This research project seeks to explain Chinese motivations for developing TNWs. In particular, this study examines the role of doctrine (driven by threat perceptions) and technology as influencing factors. This thesis seeks to explain an aspect of PRC strategic planning by identifying and examining the causal relationship between nuclear doctrine and arsenal development. The first hypothesis is a search for the dominant motivation in programmatic planning.

Certain factors influence the development of a nation's nuclear arsenal. The common belief is that perceptions of external threat lead political leaders to develop security-based national strategies. See #S1. Military strategists develop doctrines of security which support these national security strategies. The military industrial infrastructure builds defense systems following programs planned by military

strategists. According to this perspective, arsenal design responds to leadership perceptions of threat.

#S1: Threat --------> Development

This logical progression fails to explain the initial development of TNWs. An alternative to the threat-driver hypothesis better explains this period of PRC TNW development. Means other than the desires of the leadership drove development. This competing supposition posits that technology drove the development. See #S2, the primary hypothesis of this research.

#S2: Technology --------> Development

The evolution of China's nuclear arsenal can be divided into three phases. During the early 1960s, China developed nuclear weapons to satisfy security requirements. The PRC built strategic nuclear weapons to deter China's enemies. China's arsenal was driven by threat. Technology supplanted threat as the dominant driver during the next phase. From the mid 1960s to mid 1970s, research was conducted to miniaturize strategic warheads and to extend the range of China's ICBMs. TNWs emerged as byproducts of this research. During the third phase, political leaders discerned a reduction in the threat environment. These leaders acted on this reduction of threat. Resources that were allocated to the nuclear program relatively liberally during the previous phase were redirected. The nuclear program reverted to its primary objective of building strategic weapons, leaving TNWs production to level off. This thesis studies development during these last two phases, and uses the aforementioned hypotheses to explain TNW development.

The second purpose of this thesis is to examine the relationship between doctrine and development. According to the threat-driven supposition, doctrine should be developed prior to the creation of military systems. Conversely, if the primary hypothesis holds true, then TNW will be developed prior to the development

of doctrine. This thesis tests the two hypotheses to understand the motivations behind the development of TNWs in China.

C. RELEVANCE

This study is pertinent to the study of Chinese nuclear development and U.S. foreign policy. First, the body of academic study on medium nuclear powers is relatively scarce compared to the treatment afforded the superpowers. Western scholarly work on China's nuclear strategy and force development is less bountiful, possibly due to the closed nature of the state, and the primary focus on the former Soviet Union during the Cold War. As tendency mounts for total nuclear disarmament, a firm understanding of the rationale behind China's security is required.[14]

Second, sustained economic growth over the past decade has positioned China to become a strong military power. The course of modernization of China's nuclear arsenal is very important to the United States. China's increasing power will affect every regional state and international power. Many states must recompute security calculations. Several nations must reevaluate alliances and foreign policy. The ensuing transformation will be important to each state. Therefore, the findings of this study contribute to a more predictable future of security planning on regional and international levels.

D. FINDINGS

The thesis challenges the notion that security doctrine drives weapons development by examining the Chinese nuclear program. This research provides a case study of strategic and force structure planning for comparison with the other nuclear powers. Additionally, this study shows the effects of two factors on the development of China's nuclear arsenal. By understanding the operational

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[14] Malik, "China Policy Towards Nuclear Arms Control," 1.

components of this medium nuclear power, the strategic planner can forecast more accurately future Sino-American interaction. The results of this research assist strategists in global and regional planning.

The ramifications of these findings are important to U.S. foreign policy. The trend in Chinese force development is an implicit derivative of this research. This study helps to fill an emergent need for further research on the medium nuclear states. Additionally, this thesis adds to the growing body of academic research into the nuclear behavior of China.

E. ORGANIZATION

This thesis is organized into six chapters which describe the evolution of TNWs in China. This introductory chapter provides an overview of the topic. The following chapter defines terms and discusses the theory used to examine this topic. The third chapter is a historical review of the early period, in which TNWs are introduced to the arsenal. The next chapter examines the last decade of TNW development, tracing trends which lead to the capping of production. The concluding chapter presents the findings of this study.

II. DEFINITIONS AND THEORY

A. INTRODUCTION

This thesis explains the evolution tactical nuclear weapons (TNW) in the People's Republic of China (PRC) using a technological inertia model discussed later. This chapter is organized into two themes — definitions and methodology. The first section discusses the predominant range of approaches to the examination of the Chinese nuclear arsenal. Every approach provides insight into the development of nuclear weapons, but each has its limitations. Below, I discuss the strengths and weaknesses of existing theories, then propose my own. Prior to detailing the analytical framework, several terms are defined. The last section explains the causal relationships between the independent and dependent variables.

B. THEORIES AND ANALYSES

Although dwarfed by the volume of attention afforded to superpower nuclear issues, the scholarly work on China's nuclear arsenal is growing. Several theories are used to examine the evolution of China's nuclear arsenal. These can be categorized by their emphasis on strategic nuclear weapons and level of analysis. Each provides insight to understanding, inter alia, PRC nuclear policy, warfighting doctrine, nuclear strategy, and arms control stance. Unfortunately, each is limited in its ability to describe PRC TNW development.

1. The Misguided Focus

Since its entry into the nuclear club, China's growth in military capability has been impressive. According to Norris, China expanded its arsenal from a single nuclear device in 1964 to 200 nuclear warheads by 1977. In the following thirteen years, the arsenal doubled.[15] China has reached milestones of nuclear development

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[15] Robert Norris, Andrew Burrows, and Richard Fieldhouse, Nuclear Weapons Databook, vol. 5, British, French, and Chinese Nuclear Weapons (Boulder: Westview, 1994), Table 7.1, p.359.

faster than the four earlier nuclear powers, while conducting the fewest number of tests. For example, the number of months required to advance from the first fission detonation to the first multistage thermonuclear explosion was thirty-two months.[16] Each of the other nuclear powers took more than twice that amount of time.[17] Most academic work has focussed on the development of strategic nuclear weapons, thereby relegating TNWs to "side-topic" treatment.[18] These studies insufficiently analyze the motivations surrounding TNW development. Instead, TNWs are treated as supplements to strategic nuclear weapons, thereby enhancing the deterrence posture — a misleading tendency.

When TNWs are linked closely to strategic nuclear weapons, the purposes behind the two blend together. The assumption that TNWs exist for the same reasons as strategic nuclear weapons is not valid until proven. By focusing on the higher yields, analysts have difficulty explaining whether China's nuclear deterrence posture is minimum deterrence or limited deterrence with an emphasis on warfighting.[19] Additional problems arise as attention is focussed on a single level of analysis.

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[16] Norris, Nuclear Weapons Databook, Table 1.4, pp.6-7.

[17] The periods required for the others are: Great Britain-66, Soviet Union-75, USA-87, and France-102. Norris, Nuclear Weapons Databook, Table 1.4, pp. 6-7.

[18] For a series of historical analyses of strategic nuclear weapons development in China see John Wilson Lewis and Xue Litai, China Builds the Bomb (Stanford, Calif.: Stanford University Press, 1988); John Wilson Lewis and Xue Litai, China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age (Stanford, Calif.: Stanford University Press, 1994); and John Wilson Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, Goals," International Security 17, no. 2 (Fall 1992): 5-40. Other examples of this emphasis are Xue Litai, "Evolution of China's Nuclear Strategy," in John C. Hopkins and Weixing Hu, eds., Strategic Views from the Second Tier: The Nuclear Weapons Policies of France, Britain, and China (New Brunswick, N.J.: Transaction, 1995); and J. Mohan Malik, "China Policy Towards Nuclear Arms Control in the Post Cold War Era," Contemporary Security Policy 16, no. 2 (August 1995): 36.

[19] For an evolving debate on this issue, see J. Mohan Malik, "Chinese Debate on Military Strategy: Trends and Portents," Journal of Northeast Asian Studies 9, no. 2 (Summer 1990): 10-23; and Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," International Security 20, no. 3 (Winter 1995/96): 5-42, especially 10-13.

2. The Constraints of Unit Level Analysis

Many theories of development are used to test propositions in international relations. The primary theories applied to the development of China's nuclear arsenal can be separated into two categories: those which examine a single level of analysis, and those which examine multiple levels. Balance of Power theory and Organization theory fall into the first group. Socio-Technological theory is in the latter group. The strengths and weaknesses of these theories are discussed below.

Balance of Power is a dynamic structural theory which posits that states shift alliances to maintain an equilibrium of power, and prevent dominance by any single state.[20] The Sino-Soviet split and subsequent Sino-American rapprochement could be explained by this approach. The Sino-American coalition formed in the 1970s could be used to explain technological assistance provided to China in recent decades.[21] This theory examines interactions of the nation-state on the system level of analysis. Security doctrine development, international alliance formation, and supranational regime behavior can be explained using Balance of Power/Threat theories.[22] The constraint of this approach is inherent in its unit of analysis.

By analyzing the highest structural component — the nation-state — the Balance of Power theory cannot be used to explain the actions of substate actors, the strengths and weaknesses of organizations, or the idiosyncracies of political

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[20]Balance of Power theory assumes that political leaders will make rational decisions in the best interest of the country.

[21] See James C. Hsiung, "Sino-U.S.-Soviet Relations in a Triadic-Game Perspective," in James C. Hsiung, ed., Beyond China's Independent Foreign Policy (New York: Praeger, 1985), 107-32; Hans J. Morgenthau, Politics Among Nations (New York: Knopf, 1958); Paul Seabury, ed., The Balance of Power, (San Francisco: Chandler, 1965). Stephen Walt argues that states balance or bandwagon against threats. See Stephen Walt, The Origins of Alliances (Ithaca: Cornell University Press, 1987).

[22] See Gerald Segal, "The Soviet 'Threat' at China's Gates" Conflict Studies no. 143 (London: Institute for the Study of Conflict, 1983); and Shao-Chuan Leng, China's Nuclear Policy: An Overall View (Baltimore: University of Maryland School of Law [Occasional Papers/Reprint Series in Contemporary Asian Studies, no. 1, 1984 (60)].

leadership. Undoubtably, adherents to this theory will argue that lower echelons do not matter when compared to the actions of the state. By narrowing its focus solely on the state, this theory is limited in explaining TNW development. Conversely, this theory effectively explains the development of strategic nuclear weapons; for with these weapons, nations possess the ability to interact militarily and diplomatically with others.

Organizational theory, as I employ it, is applied to the development of substate structures and administrations. Organizations are coalitions composed of varied individuals and interest groups. Each component, harbors enduring differences in values, preferences, beliefs, information, and perceptions. Occasionally, these differences change. The most important decisions of organizations involve the allocation of scarce resources to components. Conflicts arise due to these enduring differences and scarce resources. Therefore, the ability to influence decisions over resource allocation is the greatest achievement of an organization. Organizational theory is applied to the development of China's nuclear arsenal.[23] Unfortunately, this explanatory method suffers from a singular level of analysis. This approach fails to capture the phenomena of interest to this study.

Technology inertia model is used for the study of PRC TNWs in this paper. The strength of this model is that it compensates for the weaknesses of others. This theory examines the effects of technology throughout the political system by transcending specific levels during analysis. Technology is shaped by the society in which it occurs. In turn, that technology shapes the society in which it operates. Political leaders, bureaucratic units, organizations and ultimately society continuously

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[23] See Benjamin C. Ostrov, Conquering Resources: The Growth and Decline of the PLA's Science and Technology Commission for National Defense (Armonk, NY: M. E. Sharpe, 1991); John Wilson Lewis and Xue Litai, China Builds the Bomb; Nan Li, "Political-Military Changes in China, 1978-89," Security Studies 4, no. 2 (Winter 1994/95): 426-58; and Chong-Pin Lin, "Chinese Military Modernization: Perceptions, Progress, and Prospects," Security Studies 3, no. 4 (Summer 1994): 718-80.

interact with technology. For several reasons, this theory is the best by which to study the emergence of Chinese TNWs.

First, PRC TNWs were not invented because of security threats from abroad. In the mid-1970s, the PRC nuclear arsenal could only establish a limited nuclear deterrence posture based on the possession of strategic nuclear weapons.[24] This capability satisfied Chinese objectives of "national self-esteem, national autonomy, security, global influence, regional preeminence, domestic political cohesion, and domestic economic development."[25] The emergence of TNWs occurred without the concurrence of the political leadership. These weapon systems do not support threat-driven security doctrines. The DF-61 tactical ballistic missile is an excellent example. John W. Lewis and Hua Di contend that the notion of equipping this system with a nuclear package for People's Liberation Army (PLA) usage did not come from political leaders.[26] A theory which examines multiple levels of analysis surpasses the aforementioned theories.

Second, by examining the TNW as a technical component of a system geared for development of strategic nuclear weapons, this theory enables the analyst to explain unusual characteristics of PRC nuclear policy. The motivations for development of TNWs may not be the same as those for strategic nuclear weapons. Also, this theory is useful for describing why TNW production has seemingly halted. Before this theory is discussed, terms are defined which enhance comprehension of the model and terminology of this field.

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[24] Chong-Pin Lin, China's Nuclear Weapons Strategy, 110-112.

[25] Chong-Pin Lin, China's Nuclear Weapons Strategy, 106.

[26] See Lewis, "China's Ballistic Missile Programs," 32.

C. DEFINITIONS

This section defines terms necessary to understand concepts of the theory, and presents independent and dependent variables.

A *strategic nuclear weapon* is a weapon system which can strike deep into the territory of an adversary. These weapons can achieve high yields (greater than several hundred kilotons), and travel long ranges (greater than 600 km),[27] while carrying significant weight (several hundred kilograms).[28] PRC strategic weapons are delivered by nuclear missiles,[29] bombers,[30] and submarines. Some of these systems can be used in tactical roles, discussed below. Therefore, the definitions which distinguish between strategic and tactical weapons must involve system characteristics, and intentions of the user.

Tactical nuclear weapons refer to those systems used within the context of a battle for direct and immediate tactical ends. These are synonymous with the term "battlefield nuclear weapons." TNWs are distinguished from strategic nuclear weapons by yield and range. The lower yield allows use of these weapons without endangering the user's own troops. The limited range of these weapons constrains their use to the theater of battle. Examples of weapons in this category are nuclear shells from field guns with ranges between 15-25 km, atomic demolition mines, and

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[27] In Chinese military terminology, only missiles with ranges above 1,000 kilotons are considered strategic. See Lewis, China's Ballistic Missile Programs, 6, note 3.

[28] Duncan Lennox, ed., Jane's Strategic Weapon Systems (Surrey, U.K.: Jane's Information Group, 1996), unpaginated.

[29] The strategic nuclear missiles in the current arsenal are the DF-3/3A, DF-4, DF-5/5A, and DF-21/21A. The extended range of these multistage missiles enables China to reach targets deep into any potential adversary's territory, including the United States. The DF-41 is assumed to be deployed in the first decade of the next century. This three-stage missile is designated to replace the two-stage DF-5, adding the capability of placing multiple reentry vehicles on an intercontinental missile. See Lennox, Jane's Strategic Weapon Systems, unpaginated.

[30] Norris tables 170 aircraft that are nuclear capable. These planes can conduct strategic or tactical strikes. These aircraft have combat ranges from 400 to 3,100 km, and are capable of delivering nuclear ordnance with yields between 10 kt and 3 Mt. Norris adds that acquisitions of Su-27 bombers could be utilized in a nuclear role, as well as Iraqi Su-24 Fencers and Mig-29 Fulcrums, held in Iran after the Gulf War. See table and discussion in Norris, Nuclear Weapons Databook, Table 7.1, p. 359, and 365, respectively.

missiles with ranges of about 100 km.[31] PRC systems which fall into this category are the "M" family of missiles,[32] short range bombers, and atomic demolition mines. TNW production is the dependent variable in this research.

Technical artifacts are products developed by the large technological system (LTS). The LTS is described below. These components shape and are shaped by society. Examples of technical artifacts produced by the LTS are nuclear warheads, command and control equipment, and submarines.

Grand strategy is a compilation of broad, enduring interests of a nation-state. These describe the general direction of the country over many years, even though specifics of implementation may change frequently. Normally, grand strategies do not change with the succession of leadership.

The *strategic vision* is the direction of national endeavor established by legitimate authority of the government. Usually, strategic vision rests with the executive branch, and is embodied in the political leader. In the United States, strategic vision is codified in the national security strategy. Subordinate units develop strategies, such as the national military strategy, to achieve the objectives of the national security strategy. Therefore, strategic vision serves as an independent variable in this analysis.

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[31] David Robertson, Guide to Modern Defense and Strategy (London: Europa Publications, 1987), 37-8. The Chinese view enemy weapons that are used within the boundaries of their territory as strategic weapons, even though those systems may have been classified by the user as tactical. Interview with senior China analyst, May, 1996.

[32] There are four missile types in the M-family, M-7, M-9, M-11 and M-18. As Duncan Lennox describes this family, "M-7 is a modified solid propellant SRBM, derived from the old Russian SA-2 'Guideline' SAM design. The M-9 has a range of 600 km, and was adopted during [the] development [phase] by the PLA. The M-11 missile was developed as a solid propellant interchangeable version of the SS-1 'Scud', capable of fitting the former Soviet MAZ 543 transporter-erector-launcher with minimum modification. The M-11 has a range of 300 km and was also adopted by the PLA. The fourth member of the M-family, M-18, was shown at an exhibition in Beijing in 1988, and appeared to be a larger two-stage version of the M-9 missile. It has been the basis for what has been described as a joint Iranian/Chinese programme to develop a 1000 km range solid propellant missile in Iran where it is known as Tondar-68." The M-9 is slated for export. The internal version, designated DF-15, may not be nuclear armed. However, its 500 kg payload is capable of delivering a high explosive (i.e. conventional) or 90 kt nuclear warhead. Lennox, Jane's Strategic Weapon Systems, unpaginated.

A *large technological system* (LTS) is defined as a complex of organizations, the structural system, people, legislative artifacts, and technical components. Interaction exists between the physical and nonphysical parts of the system during its evolution. Technological inertia theory examines the influence of the LTS on all levels of the society. The LTS serves as a facilitating unit for the development of technical artifacts. The influence generated by the LTS is either enhanced or suppressed by the independent variables defined in this section.

A *political linkage* is an authoritative connection between an organization and upper echelons of the government. An example of an early and important political linkage is that between Nie Rongzhen and the nuclear industry. Marshal Nie Rongzhen was head of the Defense Science and Technology Commission, which oversaw the development of nuclear weapons. Also, as a member of the Politburo, the Fifteen-Member Special Commission, and as Vice-Chairman of the Central Military Commission, Nie was able to channel scarce resources into the nuclear program. Political linkages are independent variables which either enhance or detract from the inertia of the LTS.

Alliances are another form of independent variable.[33] Alliance-building is an essential tool in the construction of a LTS. Like political linkages, alliances enhance the influence wielded by the LTS through the cooperation of substate organizations.

Patterns in a web are trends of formation and dissolution of cooperation. These trends are indicators of momentum in a LTS. Patterns are independent variables in this research. Variance in the aforementioned variables causes changes in the intervening variable, the LTS, which in turn causes variation in the dependent variable. See the causal relationships in Figure 2.1.

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[33] The definition proposed here should not be confused with state-to-state alliances, such as NATO. Nevertheless, the principles governing behavior in members of alliances are similar. See Lee G. Bolman and Terrence E. Deal, Reframing Organizations: Artistry, Choice, and Leadership, (San Francisco: Jossey-Bass Publishers, 1991), 183-204.

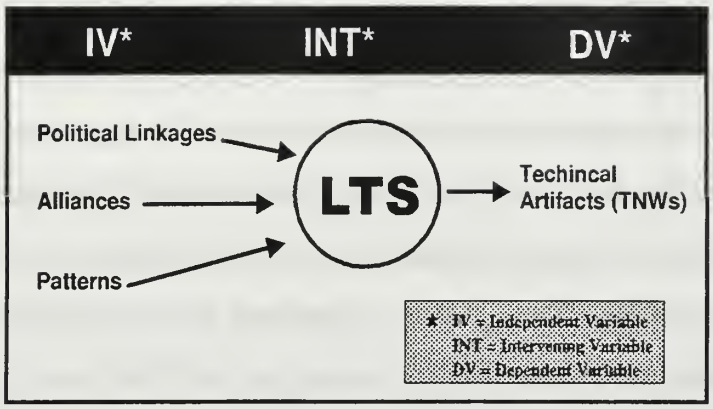

Figure 2.1. Causal Relationships

D. RELATIONSHIP BETWEEN STRATEGY AND DEVELOPMENT

According to the classical view, development of a warfighting doctrine is initiated by the leadership after recognizing a threat to national security. The leadership demands that the military create a doctrine of security which satisfies the needs of the leadership demands. Then, the defense industrial sector creates weapons which serve as the armament for that security doctrine. This sector of society draws upon the technological and economic prowess at its disposal to develop weaponry.

The above information describes a path of arsenal development based on a threat. This logical progression is generally considered to be the classic method of development.[34] This standard seemed to apply to states with robust defense budgets such as Cold War superpowers, the United States and the Soviet Union. Matthew Evangelista explains that the impetus for weapons innovation in the United States comes from the bottom-up — from scientists. "A new weapon starts with a technological idea rather than as a response to a specific threat or as a means to fulfill

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[34] The Joint Doctrine Division, J-7, of the Joint Staff defines strategy as "the art and science of developing, applying, and coordinating the instruments of national power (diplomatic, economic, military, and informational) to achieve objectives that contribute to national security." External threats to national security induce states to develop military capabilities to ensure national security. The operational concept presented here is consistent with JCS definitions. See JCS Publication 1-02: Department of Defense Dictionary of Military and Associated Terms (Washington, D.C.: U.S. Department of Defense, 23 March 1994), passim.

a longstanding mission."[35] Conversely, the impetus for technological innovation in weapon systems was generated from the top-down in the former Soviet Union.[36]

An alternate development path is the subject of this investigation on China. Consider a variant of the threat-induced arsenal development. Suppose a substantial threat exists, causing the defense industrial sector to build weapons in support of the country's security needs. The primary hypothesis of this research is that this phenomenon occurred in China during the first decade of TNW development. Since the Soviet Union was considered an arch enemy, the PRC constructed an arsenal of large yield ICBMs and strategic aircraft to deter this neighbor from strategic attack.[37] Arsenal construction followed this path for two decades.[38] Suddenly, TNWs appeared in the armory. The actual date of TNW development was debated for several years prior to agreement in mainstream Western sources. However, the common consensus is the mid-1970s.[39] Prior to their appearance, military exercises were conducted to train troops to fight on a battlefield where the opponent used nuclear weapons.[40] The production of tactical nuclear weapons forced a doctrine to be created for the Chinese military. The technological inertia model is used to explain these occurrences.

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[35] Matthew Evangelista, Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies (Ithaca, New York: Cornell University Press, 1988), x.

[36] Evangelista, Innovation and the Arms Race, x.

[37] During this period China's small nuclear arsenal exercised minimum deterrence. The philosophy behind minimum deterrence is that the adversary is deterred from attack for fear of unacceptable damage from a nuclear counterstrike.

[38] For a detailed discussion of the origins of China's nuclear weapons program, see John W. Lewis and Xue Litai, China Builds the Bomb; Alice Langley Hsieh, Communist China's Strategy in the Nuclear Era (Englewood Cliffs, N. J.: Prentice-Hall, 1962); Leo Yueh-Yun Liu, China as a Nuclear Power in World Politics (New York: Taplinger Publishing, 1972).

[39] Several sources agree on the mid- to late-1970 deployment date. See Norris, Nuclear Weapons Databook, 370-1; and Chong-Pin Lin, China's Nuclear Weapons Strategy, 78-80, and 90-2. Alastair Johnston contends that the actual date is much later based upon a 1987 General Staff Department conference report, which states that as of the late 1980s, China had no TNWs. See Johnston, "China's Thinking," 35, and note 106.

[40] Johnston, "China's Thinking," 33-4; and Chong-Pin Lin, China's Nuclear Weapons Strategy, 92-4.

E. METHODOLOGY

The methodological approach used in this research is a historical analysis using the Social Construction of Technology (SCOT) paradigm.[41] The SCOT is an academic tool used to evaluate alterations in technological systems. Bijker and others use this paradigm to explore the evolution of technology in social systems. This model of analysis is illustrative because it is capable of revealing important aspects in the technical and social components of the technological system under investigation. Pinch and Bijker describe the attributes of this model as follows:

> As we have shown, this model already does more than merely describe technological development: It highlights its multidirectional character. Also, as will be indicated, it brings out the interpretive flexibility of technological artifacts and the role that different closure mechanisms may play in the stabilization of artifacts.[42]

This approach has three main points. First, the system under examination is heterogeneous. In order for technological artifacts to emerge, the combined efforts of the technological system must focus on development. This involves gaining influence over scarce resources. Second, the evolution of artifacts is not contingent necessarily upon the desires of political authority, but upon the momentum developed by the system. Third, artifacts are the physical manifestations of the particular cultural environment. They are shaped by and embody the social and political context of their origin. The alliances, political linkages and patterns of cooperation among groups drive the development of these technical artifacts.[43]

The fact that the evolution of tactical nuclear weapons occurred under a nuclear program designed for large weapon production makes the Chinese case an

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[41] Wiebe E. Bijiker, Thomas Hughes, and Trevor Pinch, eds., The Social Construction of Technological Systems (Cambridge: MIT Press, 1987), 17-47.

[42] Bijker, Social Construction of Technological Systems, 40.

[43] For a discussion on the application of these theorems to non-proliferation, see Steven Flank, "The Historical Sociology of Nuclear Proliferation," Security Studies 3, no.2 (Winter 1993/94): 259-94, especially 261-2.

interesting one using this methodology.[44] The examination of nuclear technology is not new to this field of study. Indeed, some notable systems have been examined.[45] The following set of guidelines is used to evaluate the Chinese system.

Steven Flank provides guideposts that are useful in the examination of this case study using the Social Construction of Technology Theory:[46]

- Avoid technical superiority or cost-effectiveness as an explanation. Instead look for why or why not a system *becomes* superior or cost-effective.
- Avoid money or other resources as an explanation. Instead look for why or why not a system has access to those resources. Technology lacks the support of some crucial constituency. Sufficient resources reflect authority, consensus, or support.
- Avoid truth or reality as an explanation. Instead, look for why actors are willing to accept something as truth. The determination of truth is the social process of convincing others and ourselves. Whether contested or not, truth claims in complex societies are often mediated by social position.
- Look for how alliances form, how they shape the system, and who the allies are. Individual actors or monolithic organizations rarely have the power to create large technological systems. Instead, a large technological system (LTS) evolves by combining organizations, interests, existing artifacts, and other heterogeneous elements. Alliance building is a key mechanism in the development of an LTS.
- Look for how links in the network are strengthened, and how they stabilize the system.

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[44] For a discussion on the military-controlled, nuclear industry see John W. Lewis and Xue Litai, China's Strategic Seapower, 74-78.

[45] Donald MacKenzie has studied the development of strategic guidance systems in Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance (Cambridge: MIT Press, 1990). Steven Flank studied the proliferation of nuclear weapons in South Africa and India in "The Historical Sociology of Nuclear Proliferation," 259-94.

[46] Flank, "Historical Sociology of Nuclear Proliferation," 259-94. The following modified precepts draw heavily upon Flank's work.

- Look for patterns in the web. Evaluate how certain alliances form or become more obsolete. Sophisticated technology requires control over its production and environment, continuity in people and organizations (preserving tacit knowledge and patterns of authority), and a steady flow of resources from outside organizations. However, high level purges, organizational realignment, and a shortage of experienced engineers may undermine the stability needed to produce sophisticated artifacts.
- Avoid motives or interests as explanations. Instead, go beyond them to determine who makes the decisions, and how they are formed. Recognize the simultaneous and interactive way in which interests come to be defined. Question linear means-ends explanations of how interests translate into actions or artifacts. This final precept pertains heavily to the examination of a system to discover future trends given present clues. In the historical case under examination, it is sometimes possible to simplify past events and artifacts into a linear progression. However, it should be noted that the crux of the SCOT is to view the development of a technological system with a multidirectional lens.

With this guiding framework in place, the SCOT paradigm is used to examine the development of tactical nuclear weapons in the People's Republic of China.

III. ORIGINS OF CHINA'S TACTICAL NUCLEAR WEAPONS

A. INTRODUCTION

This thesis argues that the development of China's nuclear arsenal can be separated into three distinct phases. In the early 1960s, China's drive for the development of strategic nuclear weapons was inspired by security threats. China began its quest for a nuclear bomb with Soviet assistance. The abrupt withdrawal of Soviet expertise forced China to continue its quest alone. Two incidents stimulated the Chinese to build an indigenous infrastructure for producing nuclear weapons — the 1956-58 Taiwan Straits crisis and the Sino-Soviet split.[47] Initially, China sought strategic nuclear weapons systems capable of striking the heart of an adversary's territory.[48]

The second period emerged from efforts to modernize weapon systems developed in the first period. Approximately a decade after China's 1964 detonation of its first atomic device, tactical nuclear weapons (TNWs) entered the nuclear arsenal. This period is distinguished from the first by the dominant factor driving development. Technology, not threat, drives development in this period. The following pages describe the Chinese effort to develop TNWs. The following chapter describes the shift back to threat-driven development.

This chapter explains the sources of China's development of a tactical nuclear arsenal. Did the production of TNWs precede doctrines of usage or did doctrinal requirements drive the development of TNWs? If TNWs entered the arsenal without

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[47] For detailed analysis of the political decisions to enter the nuclear realm, see John W. Lewis and Xue Litai, China Builds the Bomb (Stanford, California: Stanford University Press, 1988).

[48] Descriptions of strategic threat and strategic nuclear weapons are difficult to define because of differences in range, delivery, capability and doctrines by the possessors of these systems. See Duncan Lennox, ed., Jane's Strategic Weapon Systems (Surrey, U.K.: Jane's Information Group, 1996). These are defined in Chapter II.

a prior doctrinal requirement for them, then the appearance of these weapons probably originated from lower-tier entities of the technological system, such as the People's Liberation Army (PLA) and the Defense Science and Technology Commission (DSTC). China expanded its large technological system (LTS) in response to a perception that its industrial complex was vulnerable to attack. Expansion was pursued at great cost to the country. [49] The technological system became self-perpetuating, allowing lower tier entities to decide upon the direction of future arsenal development. This chapter explains how these entities were emplaced and empowered to act on the decision to diversify the arsenal and build TNWs.

Second, this chapter explores whether the technology-driver is a more compelling factor than the threat-driver for the introduction of TNWs. PRC leaders had a world view which was built in conflict. They perceived adversaries as enemies to be defeated, rather than opponents with whom to compromise. This outlook forced leaders to develop strategies which ensured the security and prosperity of the state. These strategies directed the development of military doctrines which, in turn, are supported by strategic nuclear ordnance. However, TNWs developed differently. This chapter argues that the development of TNWs preceded doctrine.[50] The diversification of the arsenal forced military planners to rethink the battlefield use of TNWs.

This chapter provides explanations of the change in focus of the technological system, from solely developing strategic nuclear systems to producing tactical systems. Throughout this period, social and political linkages are identified which caused the LTS to propel itself forward. I argue that the momentum developed by the LTS during this period caused TNWs to be produced. Technology, not threat, drove

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[49] During the early 1960s, approximately fifty percent of China's GNP was expended on nuclear program development. See discussion on the "Third Line" later in this chapter.

[50] Chong-Pin Lin, China's Nuclear Weapons Strategy: Tradition within Evolution (Lexington, Mass.: Lexington Books, 1988), 91-96.

development. Understanding of the strengths and weaknesses of this system in society establishes the foundation for the next major shift in tactical nuclear weapon production, described in the following chapter.

This chapter is organized into three sections which describe historical phases in the development of this technological system. First, the effects of several phases of social development on the growth of the technological system are summarized. Next, Mao's decision to develop strategic nuclear weapons is explained.[51] This is followed by an explanation of the differences between Mao Zedong, his protégé Hua Guofeng, and Deng Xiaoping. Finally, conclusions are drawn from analysis of this period of tactical nuclear weapon emergence.

B. FROM MINIMUM DETERRENCE TO MASSIVE DETERRENCE

Research into China's science and technology growth should focus on the historical influences of society. A 1977 OECD report states:

> The development of Chinese science and technology cannot be fully grasped without extensive reference to the socialist background. Science is considered a product of a given society, which lends to its ideological characteristics, even if the research performed is universally valid.[52]

Accordingly, the study of the growth of the LTS is started years prior to its production of TNWs.

1. Status of the Program Inherited by Deng

Mao's dilemma was interesting. He had moved away from one pole of the loose bipolar system which was developing as the cold war emerged, toward a loose

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[51] During the early stages of China's independent nuclear program, resource constraint compelled Mao to choose the development of strategic nuclear weapons, placing TNWs on hold. See Chong-Pin Lin, Chinese Nuclear Weapons Strategy, 95.

[52] Organisation for Economic Cooperation and Development (OECD), Science and Technology in the People's Republic of China (Paris: OECD, 1977), 210.

tripolar system.[53] In order to achieve this goal, the PRC had to develop a capable nuclear program. Communist China realized that as long as superpowers virtually 'monopolized' the world's nuclear weapons, its objective of becoming a great power would be very difficult, if not impossible, to accomplish.[54] Aiming for this objective, Mao moved from a close alliance with the Soviet Union to self-reliance. The following section examines the social, economic, and political transitions which took place and their effect on the momentum of the LTS.

2. Sino-Soviet Cooperation

Strong historical influences acted on Mao, which led to his particular type of leadership. His sense of massive resistance was rooted in early Chinese strategic philosophy, and exercised in battle. Mao emphasized successful social transition toward communism using the forces of the masses. It was through this mass populace that Mao defeated the U.S.-backed Nationalist forces during the Chinese civil war. Mao's vision of unlimited human resources, coupled with limited physical resources, affected technological development. The LTS was the nuclear program. The growth of the LTS was hampered by the initial plans and further misdirected by internal turmoil. Mao's first economic plan promised to produce the financial springboard from which a large technological system could be launched. The foundation of the program, which was built with heavy Soviet assistance, was laid out in the 1957 Sino-Soviet Agreement on New Technology for National Defense.

This Sino-Soviet Agreement provided the technical assistance required for the Chinese nuclear weapon. Under the New Defense Technical Accord signed in Moscow and Beijing, the Soviet Union agreed to supply China with a prototype

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[53] Loose tripolar system refers to the balance of power in east Asia between the United States, the Soviet Union and China during the Cold War. China had insufficient power projection capability to establish a global tripolar system.

[54] Leo Yueh-Yun Liu, China as a Nuclear Power in World Politics (Englewood Cliffs, N.J.: Prentice-Hall, 1962), 25.

atomic bomb and related technical data. Also, Moscow agreed to assist in the construction, training, and operation of a gaseous diffusion plant in Lanzhou to produce enriched Uranium-235. Soviet assistance to China's nuclear effort deepened considerably under this agreement.[55]

The Sino-Soviet split, discussed later, abruptly ended this arrangement. The withdrawal of Soviet technical expertise and financial assistance severly hampered the rapid development of the Chinese LTS. China's economy was damaged further by national economic plans. These failures further weakened the foundation of the LTS.

The economic boom promised by the First Five Year Plan (1953-57) failed to materialize. Therefore, Beijing balanced the economy by transferring money from profitable sectors to support weaker sectors. Specifically, central planners attempted to revitalize the industrial sector using surplus from the agricultural sector. Further improvements were made in the strongest sector by emulating the Soviet plan. The agricultural sector was streamlined, following this centrally-planned model. Cooperatives were merged forcibly into communes. However, the economy continued grow slowly. Mao's response to economic shortfalls was the Great Leap Forward.

3. The Great Leap Forward

The Great Leap Forward (GLF) was launched to invigorate the economy. Because progress was based on inaccurate agriculture reports, the GLF appeared successful. However, actual agricultural reports indicated a more dismal result.

> As a result of misinformation about labor requirements and hysterically falsified statistics, it was claimed that agricultural output was being doubled in one year, and that immense transfers of labor to other

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[55] See John W. Garver, Foreign Relations of the People's Republic of China (Englewood Cliffs, N.J.: Prentice-Hall, 1993), 55.

employments were immediately possible. The result was acute agricultural shortages....[56]

Mao's political opposition desired change.

There were few critics among the top leaders of the CCP. Those who opposed implementing this program were purged. Some argued that the transformation from socialism to communism had occurred too rapidly. People suffered greatly as famine gripped the land. Mao admitted making a mistake. As the sole individual who openly questioned Mao, Marshal Peng Dehuai was removed from his post as defense minister,[57] affecting the growth of the LTS.

The GLF is considered a failure. Techniques practiced led to poor production. For instance, iron and steel were produced in backyard furnaces using scrap metal.[58] Because adequate temperature could not be maintained, this steel was of poor quality, and frequently resulted in plastic deformation. In this respect, the GLF was a technical failure. However, with respect to social technological growth, the GLF was a partial success because it fostered attitudes conducive to the fusion of technology with society.

The government was able to maintain control of society despite the presence of one of the strongest elements of revolt — starvation. China's public continued to support politically the revolutionary government in its efforts to modernize. They

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[56] Colin Clark, "Economic Development in Communist China," 239.

[57] Peng Dehuai was one of ten military officials promoted to the rank of Marshal in 1959. Since then, no one has reached this rank. Marshal Peng negotiated and signed the New Defense Technology Accord committing Soviet assistance to the development of Chinese strategic and tactical nuclear weapons. As chairman of the CMC, Peng drove the transition of military doctrine from the concept of "people's war," toward active defense and mobile offense, thereby challenging Mao's edicts. Lin Biao replaced defense minister Peng in 1959, during a restructuring which caused other senior military leaders to move up the ladder of command. Mao's reorganization provoked personal animosities and caused rival networks to grow. See Lewis, China's Strategic Seapower, 8, 189, 254, note 2, 318, note 36; and Jonathan Spence, The Search for Modern China (New York: W. W. Norton & Company, 1990), 581-82.

[58] Robert Worden, Andrea Savada, and Ronald Dolan, eds., China: A Country Study (Washington, DC: U.S. Government Printing Office, 1988), 44.

were willing to endure physical hardship, and political mismanagement to accomplish national objectives. Societal support is crucial to the development of the LTS, especially under conditions of limited resources. Yeu-Farn Wang describes the effects of the aforementioned movements:

> Despite the impact of the Anti-Rightist Campaign and the Great Leap Forward, China's scientific research and development still managed to move forward along the line of the Twelve-Year Science and Technology Plan, though certain priority areas were neglected. Growing differences with the Soviet Union during this period contributed to the increasing emphasis on military R&D. Therefore, notwithstanding the growing tension in relations between the State and intellectuals, certain political leaders ordered that the core of the country's scientific manpower should be protected from the disturbance brought about by political upheavals. This implied that the "red versus expert" debate had another dimension at the upper stratum of the research establishment, which was by then engaged in R&D activities related to national security.[59]

As Yeu-Farn Wang explains, critical support for intellectuals was maintained at the upper echelons of the government. Strong political linkages prevented irreparable damage to the development of the nuclear program. Additionally, Deng Xiaoping eliminated "redness" as a standard of measure for scientists soon after Mao died. International events introduced an equally important dimension in the development for the large technological system.

4. The Sino-Soviet Split

In the 1950s Soviet money and knowledge was a boon to China's development. Without the Soviets, China would have spent decades developing such a sophisticated industrial and administrative infrastructure. The Sino-Soviet split was devastating for the LTS. As a consequence, this rift delayed the emergence of TNWs.

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[59] The LTS was protected from social upheavals. Research and development organizations and scientists faired more favorably than many other sectors of society. See Yeu-Farn Wang, China's Science and Technology Policy: 1949-1989 (Aldershot, England: Avebury Ashgate Publishing, 1993), 56.

The Sino-Soviet split arose, in part, due to differences in Marxist-Leninist ideology. Khrushchev's 1956 denunciation of Stalin outraged Mao. Khrushchev expressed reservations about the foreign policies of the PRC and attempted to use Soviet aid to force alterations in China's foreign policy stances. He espoused peaceful coexistence with capitalists and withheld resources vital to the success of the Great Leap Forward. Khrushchev refused to reveal the atomic secret to China, causing Mao to feel betrayed.

Elsewhere, Chinese leadership faced a myriad of regional disasters, including a right-wing coup in Laos, protests in Tibet, and a crisis in Indonesia. Disagreements between Mao and Khrushchev on the proper method to handle these situations led to the Sino-Soviet split. Soviet technical experts were ordered back to the Soviet Union.

Yeu-Farn Wang explains the impact of this withdrawal on the developing Chinese industrial infrastructure.

> For a decade, China's technical dependence on one source had limited its choice of technologies and oriented its capital goods industries toward production of Soviet-style machinery and equipment. Once the Soviets suddenly pulled out, the PRC was left high and dry to manage projects conceived and executed under Soviet tutelage. Left with only prototypes, the Chinese had no choice but to reverse engineer them, a process that took years....[60]

This rift forced China to reorganize itself without external assistance from the Soviets. Mao directed the LTS to continue working toward nuclear weaponry without Soviet assistance.

At this point Mao was challenged by three factors: (1) no superpower alliance with which to contend with the West; (2) a failing economy which was imbalanced along sectorial lines; and (3) the withdrawal of technical and financial assistance by the Soviet Union. The objective to achieve great power status remained the national

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[60] The Sino-Soviet split significantly slowed production of nuclear weapons, ballistic missiltes, and submarines. However, this rift helped to place the LTS in high regard, building its influence over the direction of resource allocation. Yeu-Farn Wang, China's S&T, 59.

goal despite these challenges. Mao drew upon his greatest proven resource, the revolutionary ardor of the masses. To inspire the leadership, Mao utilized the spirit of the revolution which had been so successful in his past.

From 1961-1966, the momentum of the LTS was robust. This was a critical period of nuclear program development because an additional nuclear production complex was built. As described later in this chapter,[61] scarce resources were allocated for construction of a third nuclear production line. This eventually led to the advent of TNWs.

5. The Cultural Revolution

The Great Socialist Cultural Revolution was begun in 1966 by Mao Zedong as a means of revitalizing China's revolutionary zeal. The prelude to this movement was the debate over Wu Han's accounts of Hai Rui in a sequence of plays which alluded to the removal of Peng Dehuai from his military post. Peng's replacement, Lin Biao, allied himself with Mao and focused PLA admiration on the Chairman through the 1963 publication of *Quotations from Chairman Mao*. This marked a trend for closer ties between the military and the civilian leadership.[62]

Marshal Peng's replacement was opposed by the heretofore silent critics of Mao. Two groups reviewed Wu Han's case. The more conservative of the two groups, the *Group of Five*, attempted to quell the tensions by recommending that the plays be treated as an academic debate instead of a political assault. The more critical group, whose members Jonathan Spence characterizes as "the radical or

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[61] See the description of the political linkages which led to the control of resources by the nuclear program under subsections "Material Infrastructure," and "The Third Line" later in this chapter.

[62] This unstable pattern persisted throughout this early period. Each shift affected the momentum of the LTS. Mao continually questioned the civil-military relationship. His idiosyncrasy resulted in many reorganizations within the military hierarchy. For instance, Lin Biao lifted PLA leaders into increasingly prominent positions in the party and government. However, after ascending to the second highest military post, Lin Biao was undermined by Mao. See John King Fairbank, China: A New History (Cambridge: Harvard University Press, 1992), 400, and 401-405.

nonestablishment intellectuals," saw Wu Han's plays and other forms of art and literature as conspiratorial and diametrically opposed to Mao's thoughts.[63] Public reaction to these social upheavals affected the LTS development by breaking linkages with traditional relationships and establishing linkages to the intelligentsia. This revolution affected the latter connections negatively, then positively.

Radical students, organized and trained as Red Guards, staged demonstrations and led brutal attacks on the "four olds": old ideas, old culture, old customs, and old habits. This seemed to defy one of the mainstay relationships—father to son. However, the youth were a repressed group which yearned for an opportunity to alter its position in the societal structure. During the mass campaign against intellectuals and foreigners, those accused of being "bad elements" or "revisionists" were forced to perform manual labor and were humiliated publicly. High level leaders such as Deng Xiaoping and Liu Shaoqi were removed from their posts. Eventually, these leaders would become the saviors of the intellectual community and rejuvenate the LTS.

6. Results and Implications

In the Cultural Revolution, we see important trends for the development and diversification of the LTS. Several effects were: expanded defense industry, strained civil-military relations, broken social traditions, and degraded academic institutions. According to Sydney James, the effects of the Cultural Revolution transcended the economy, affecting the defense industrial sector despite the efforts of the central leadership.

> The central authorities sought to insulate the defense industry from the effects of the Cultural Revolution. Nevertheless, political activity and factional conflict in the factories caused frequent disorders, occasionally of a prolonged and serious nature. Disruptions of the

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[63] Jonathan Spence, Search for Modern China, 602-608. The following summary draws heavily on this account and that of John King Fairbank, China: A New History (Cambridge: Harvard University Press, 1992).

> transportation and communication system led to delays in the delivery of raw materials, parts, and subassemblies.... A large number of leading Party and government officials were removed from office, with a resultant decline in policy initiatives. The curtailment in military production during the Cultural Revolution was not so severe or lengthy as during the Leap Forward. By the second half of 1968 the worst effects of the Cultural Revolution were over, and another period of growth in defense production had commenced. Production appears to have risen rapidly in the following years, with output in 1971 being more than double in 1967.[64]

A period of retrenchment followed the Cultural Revolution, during which Lin Biao was accused of an attempted coup. Two years after Lin's peak in power, the government reported that he and his family had died in airplane crash while fleeing to the Soviet Union. Lin's personal ambitions were questioned by Mao. Common people were confused by the capability of the CCP to reverse its opinion concerning who was loyal and who was not.[65] Lin Biao's fall from grace exacerbated that confusion. Mao's credibility suffered in the end. China's political leadership exhibited distrust of the military forces for several years following the alleged coup. The resulting political and military shakeups adversely affected military influence in political circles and the allocation of resources for research and development.[66] Also, Deng's purge affected LTS growth.

Deng fled to the southern province of Canton after the power struggle. He allied with old political connection General Xu Shiyou, who helped reincorporate Deng into government. In 1977, Deng was rehabilitated and re-appointed vice-premier in the Politburo and to the Military Affairs Commission. Deng's accession to these posts were important to LTS development. As head of the powerful Central

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[64] Sydney James, "The Chinese Defense Burden," in China: A Reassessment of the Economy, (Washington, D.C.: GPO, 1975), 463.

[65] Sydney James, "The Chinese Defense Burden,"463.

[66] Sydney James, "The Chinese Defense Burden," 463.

Military Commission (CMC), Deng was able to influence directly the progress of the LTS. Deng's more pragmatic vision for the People's Republic of China led to organizational alterations which allowed technological freedom of scientists working in the LTS. To consolidate his power, Deng positioned his supporters in influential positions and eliminated his opposition. As explained below, these alterations led to the transition from sole development of heavy nuclear weapons to the integration of TNWs to the production program.

C. NUCLEAR STRATEGY UNDER MAO

1. Three Choices

Mao's strategy evolved from his perceptions of threat from the superpowers. By initially not having nuclear weapons, Mao had three options for the direction of China's foreign policy: total nuclear abdication, nuclear proliferation to all states, or entry into a limited "nuclear club" by development of nuclear weapons.[67] Liu contends that these choices are not mutually exclusive; instead, each complements the other.[68] The overall goal in the early stages was to break the nuclear monopoly of the superpowers. Each of the aforementioned foreign policy options satisfies that goal. History records that the third option was pursued. Mao taunted the adversarial arsenals as "Paper Tigers" while he pursued a plan of rapid acquisition. His warfighting doctrine rested on the strengths of the populace.

The People's War under modern conditions, promulgated in 1959, lasted until the late 1970s. Lewis describes the revision of the People's War as:

> The revision of the concept depended on three assumptions. First, the military concluded that a future war would be large scale and employ sophisticated weapons. Second, the war would inevitably escalate,

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[67] Mao's foreign policy choice was to break the nuclear monopoly enjoyed by the United States and the Soviet Union. Eventually, this decision led to the establishment of a limited number of declared nuclear states, known as the "nuclear club."

[68] Leo Yueh-Yun Liu, 26-32. Liu discusses the nuances of this apparent dichotomy of choices in detail.

> making China the main battlefield. Finally, at the beginning of the war, the enemy would possess superior arms. The war would be prolonged and costly, but in the end 'the people' would prevail.[69]

These assumptions and the revised concept persisted until altered by Deng. The scope and direction of military development rested solely with Chairman Mao. Until his death in 1976, defense production fulfilled the requirements set forth by Mao's conception of the threat to China's national security.

Research projects on ballistic missiles and bombs were integrated under one command, whose goal was to strengthen China's national defense through the development of a nuclear arsenal.[70] Consequently, evidence of TNW development is scarce during this period. Chong-Pin Lin discusses several key issues concerning the development of China's tactical nuclear arsenal. He points out that although PRC leadership was interested in developing these weapons during the infant stages of the nuclear program, TNWs were on a lower priority than the development of heavy weapons and their means of delivery.[71] Marshal Nie Rongzhen commanded the PRC's defense science and technology from 1956 to 1966. In his memoirs, Nie recalls the early days of TNW development:

> The mere possession of conventional weapons does not guarantee the security of our nation. Moreover, the conventional weapons we could produce at the time were far behind, in capabilities and qualities, those of the technologically advanced countries.... In the modern era we must develop advanced weaponry including ballistic missiles and the atom bomb.... In 1956, we founded the Ballistic Missiles Research Institute.... The Institute consisted of several sub-institutes that carried

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[69] John Wilson Lewis and Xue Litai, China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age (Stanford: Stanford University Press, 1994), 211-214.

[70] Chong-Pin Lin, China's Nuclear Weapons Strategy, 79.

[71] Chong-Pin Lin, China's Nuclear Weapons Strategy, 78-81.

> research on not only strategic ballistic missiles but also a variety of *tactical ballistic missiles....*[72]

From his post as General Secretary of the CCP, Deng Xioping appointed Nie to the leading role in the development of China's scientific, military and nuclear industry.[73]

2. Material Infrastructure

Marshal Nie Rongzhen directed the daily operations of the nuclear program. Nie built the infrastructure of the nuclear industry. The sites were selected by Deng. This combination of personalities and personal power propelled the nuclear LTS into a place of dominance in the PRC. Originally, one of the leaders in the Long March (1934-35), Nie became the central figure by virtue of his role as leader of the organizations developing China's LTS and his decision-making position on key councils.

> As Vice Premier of the State Council in charge of science and technology, Nie was in a unique position to assure support for the nuclear weapons and missile programs. He was head of the Scientific Planning Commission charged in 1956 with implementing a national twelve year plan for scientific and technological development, which emphasized nuclear weapons development. In addition to director of the powerful Defense Science and Technology Commission, he was a member of the Politburo and the Fifteen-Member Special Commission and was Vice Chairman of the Central Military Commission. Between 1959 and 1965, the restructured and renamed Second Ministry of Machine Building Industry settled into the dominant bureaucratic role in implementing the nuclear weapons program. Under the Second Ministry were some dozen bureaus charged with the various tasks involved in producing nuclear weapons.[74]

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[72] Chong-Pin Lin, China's Nuclear Weapons Strategy, 79-80.

[73] Norris, Nuclear Weapons Databook, 344.

[74] Norris, Nuclear Weapons Databook, 342-43.

This nuclear bureaucracy led to the construction of several dozen nuclear sites for the development of the LTS. Insufficient information is available to determine which sites led to the development of TNWs as opposed to other components of the LTS. However, it is safe to assume that several research and development sites were involved. These sites range from the facilities tasked with the production of fissile materials to the test sites which completed operational designs. Many are located in the Northwest region, an area developed for military testing and reconstitution. An excellent example of the influence wielded by the LTS is its ability to develop the Northwest region under the rubric of the Third Line.

3. The Third Line

The LTS was so powerful and well-connected that it was able to construct a "Third Line" nuclear industrial infrastructure from 1964 to the late-1970s.[75] This additional set of facilities is entirely separate from, and is a more modern complete nuclear fuel cycle than, the Soviet-assisted one which preceded it. Its design was based on the need to provide a strategic reserve, initially against the United States and later against the Soviet Union. The sites are located in geographically strategic positions which make use of topographic features for protection against attack. The enormous scale of the undertaking is evidence of the connections between this nuclear LTS and other key parts of the political hierarchy. Norris states that this undertaking was pursued despite the negative impact it had on the Chinese economy.[76]

Third Line discussions began during the early 1960s. Lin Biao used this issue in a speech before the "7,000 cadre conference" in January 1962.[77] The Third Line

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[75] The term "third front" (saxian) is often translated as "third line," "third corps," or third rank." Barry Naughton prefers the term "third front" because of its military connotation. See Barry Naughton, "The Third Front: Defence Industrialization in the Chinese Interior," The China Quarterly 115 (September 1988): 351-86.

[76] Norris, Nuclear Weapons Databook, 348-49. As noted by Norris, costs of the Third Line are estimated between 40-53 percent of the Chinese budget during this period.

[77] Naughton, "Third Front," 532.

concept was devised to protect coastal regions to the interior. See Appendix, Figure 3-1. However, in 1964 Mao's motivation for implementing this plan returned as the United States stepped up operations in Vietnam. Naughton states that this marked the beginning of the Third Line Plan:

> Mao advocated moving existing factories inland, and constructing railway lines in Sichuan, Guizhou, and Yunnan at maximum speed, even if this involved tearing up tracks elsewhere to obtain rails. Mao's proposals were adopted, apparently without dissent, and by the end of the year, activity in these areas was surging forward with top priority. This marks the clear beginning of Third Front construction, which was to dominate Chinese industrialization efforts for the next seven years. Through 1971, every other economic objective, with the exception of petroleum exploitation, was subordinate to the completion of the Third Front.[78]

Naughton notes that the Third Line Program was given overwhelming investment support as a national priority from 1965 to 1971. As such, the program was characterized by four persuasive traits: "it was large; hastily prepared; military related; and constructed in a highly dispersed fashion." These characteristics serve as evidence of the ability of the growing LTS to command the limited resources available to the Chinese. For instance, this enormous undertaking was costly.

> The first phase of the Panzhihua complex...cost 3.74 yuan; the Chengdu-Kumming railway, 3.3 billion; while the coal mining complex in Guizhou cost well over one billion yuan. For comparison, total budgetary capital construction in 1965 and 1966 was 16 and 19 billion yuan respectively.

These expenditures absorbed large percentages of the national investment. See Appendix, Figure 3.2.

Due to the closed nature of these facilities, little is known about which particular sites were used in the development of TNWs. However, Naughton points to several regions of military industry. Substantial investments were made in western

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[78] Naughton, "Third Front," 353.

Hunan and Hubei south of the Yangtze, but few details are available. Strategic facilities were placed in areas surrounding Hunan, Guizhou,[79] and Sichuan. In Chongqing, military industry was given priority in 1965 and 1966.

> According to the Ministry of Nuclear Industry, 'In order to ameliorate the strategic distribution of the nuclear industry, we began in 1966 to construct a nuclear industry rear base area, which began in 1966 to around 1970.' This may refer to the western Hunan/southwest Hubei region....[80]

The LTS had grown so powerful, through its connections with political leadership and its importance to the society, that it was now able to direct resources. The development of this LTS is analogous to a child rolling a palm-sized show ball down a slope. Early in the descent, the child (leadership) is able to direct the motion and speed of the snowball (LTS). Eventually, however, the snowball amasses so much size and inertia that the child can no longer stop or direct the snowball. The snowball dictates its own direction. The only way it can continue is to increasingly gain more mass and momentum. Frequently, chunks of snow will fly off the barreling mass. Although these unintentional fragments (TNWs, atomic demolition mines, enhanced radiation weapons) were not mandated specifically by the child, they can be utilized by the child to create a snowman (a diversified arsenal). Afterwards, this child must develop a plan (doctrine) to use the snowman. Such is the case with TNWs during this period.

4. Organization

The organizational role of the CMC is to guide the development of the nuclear arsenal by directing the number and type of weapons to be produced. The CMC receives input from each component of the armed forces; the People's Liberation

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[79] Guizhou is one of the two vast industrial bases slated for rapid completion for explicit military purposes during the first phase of the Third Line. See Naughton, "Third Front," 356.

[80] Naughton, "Third Front," 360 and passim.

Army (PLA), the Navy (PLAN); and the Air Force (PLAAF) as to what kinds of weapons are needed.[81]

In the latter stages of Mao's leadership, the CMC established the main objectives of the LTS. Efforts were focussed on reducing the throw weight of strategic nuclear weaponry. These efforts were necessary to strike deep targets in the Soviet Union. Heretofore, the strike capability of the nuclear arsenal was limited in range due to its emphasis on heavy weaponry, and the defensive capabilities of the adversary. This new objective indirectly facilitated the introduction of TNWs.

By striving to reduce the weight of its weapons payload, designers had to delve into theories of miniaturization. These efforts were accompanied by the companion objective of diversification.[82] Enhanced radiation weapons were discussed, studied, and eventually fielded. Nuclear land mines were developed.[83] With these modernizations came the need to plan for their strategic usage. Chong-Pin Lin discusses the appearance of articles on nuclear training and nuclear exercises in the official press of the PLA.[84] These articles appear after the introduction of new weapons technologies to the arsenal. In an attempt to modernize, the LTS introduced weaponry for which there was no clear threat-driven need.

D. DENG'S STRATEGIC VISION

1. Post-Mao Period

A transitionary period followed Mao's death. This affected the growth of the LTS in three areas: financial support, political leadership, and civil-military affairs.

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[81] Norris, Nuclear Weapons Databook, 342.

[82] Chong-Pin Lin, China's Nuclear Weapons Strategy, 88-91.

[83] Chong-Pin Lin, China's Nuclear Weapons Strategy, 91. Nuclear (or atomic) demolition mines are a subset of TNWs used by PLA ground forces.

[84] Chong-Pin Lin, China's Nuclear Weapons Strategy, 92-94.

This section discusses the Four Modernizations, Hua Guofeng's brief interlude, and civil-military tension.

Lin Biao's ambitions to succeed Mao and the buildup of Soviet troops along the border led to the rethinking of U.S.-China relations in the early 1970s. The need for resources and the difficulties of following the Marxist path prompted Mao's attempts to connect with the outside world.

Relations between the United States and the PRC gradually warmed and culminated with a high level meeting between Mao and Nixon. A joint communiqué on the current state of U.S.-Chinese relations and attitudes toward Taiwan was issued shortly thereafter. Many deals were signed with the United States, Japan, Britain, West Germany, and France for imports of advanced technology. These facilitated advancements to the LTS. Tactical nuclear weapons, as well as other munitions, improved as a result of these technological sources.

Mao and his supporters launched a campaign which attacked Confucius and Lin Biao. This was an ideological campaign about the over-Westernization and abandonment of Marxist values. The CCP sought to restore its prestige and legitimization.

With the coming death of Mao and the partial opening of China to the West, questions arose over the direction of China's economy. The more conservative leaders of the Cultural Revolution, led by Jiang Qing (Mao's third wife), insisted upon indigenous efforts at national development. Those views were countered by Chinese planners who desired more dynamic growth available through foreign technology and enterprise. Among the leaders of the latter group stood Zhou Enlai, Chen Yun and Deng Xiaoping.

A third figure, Hua Goufeng, emerged the intermediary. He gave a speech concerning what could be learned from Dazhai. Dazhai was forwarded as a modernization example after which other regions could be modeled. Self-reliance,

high production levels, and mechanization drove that prosperity. Hua envisioned a country full of Dazhais pulling China's economy upward. He suggested modernization in the four areas, thereby, claiming ground already staked out by Zhou Enlai and Deng Xiaoping.

The Old Guard dies. When the old guard — Premier Zhou, Marshal Zhu De and Chairman Mao, died in 1976 — a political vacuum formed. Because of an ensuing power struggle between moderates and radicals, Deng Xiaoping was ousted from his government and party posts. The compromise candidate, Hua Guofeng, had ties to both factions. Hua, a Mao protégé, became premier.

Under Hua, moderate policies prevailed. He eliminated the radical opposition by having the Gang of Four arrested and charged with numerous crimes. To consolidate his position, Hua maneuvered to have himself named to succeed Mao as party chairman. Hua then concentrated on stabilizing politics and fostering economic development. To carry out his program, he appointed moderate officials to high positions.

Hua's personnel changes and moderate policies hindered the rapid production of TNWs by the LTS. However, the bulk of the research and development had been completed by the time of Hua's emergence. Therefore, products began to be delivered late during his time and early during Deng's tenure.

2. Emergence of Deng

Deng's strategic vision differs from Hua's/Mao's vision in that Deng was more pragmatic. Deng's consolidation of power benefited the evolution of the LTS and the production of TNWs because the two were the personal constructs of Deng prior to his most recent purge before ascending to power. In December 1978, Deng reintroduced an improved version of the Four Modernizations Program that had its antecendents in a program originally discussed years earlier. Now, the program

became associated with Deng. Although the primary focus of this program was economic, the socio-political ramifications of the reforms impacted the LTS.[85]

The method by which Deng acquired sole leadership is an important transformation for the LTS because this change introduced political linkages (alliances) to other influential sectors of society. Domestic political changes are sometimes necessary for technological modernization. According to David Mussington, indigenous development of human capital is a critical element for success.

> A strong cadre of engineering, scientific, and manufacturing talent is necessary for rapid defense-industrial development. Strategies used by developing countries to establish defense-industrial capabilities should logically include programs for capital development.[86]

In this vein, Deng rehabilitated the intelligentsia.

Dreyer records the increase in status of the intelligentsia. See Table 3.1.

> In order to enlist the support of intellectuals, the Maoist characterization of them as 'the stinking ninth category' was removed. Experts were [no longer] to be despised — their advice would be actively sought out.[87]

In this manner, the LTS was able to survive the weaknesses mounted against it during Hua's brief interlude. Further, the LTS established the required foothold in the direction of the nation which allowed the LTS to grow. At this point, the LTS was altered irreversibly in its scope, linkages, organizations, and direction. These changes were necessary to produce the artifacts of technology, seen as diversification.

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[85] For a discussion on the impact of the Four Modernizations, see June Teufel Dreyer, China's Political System: Modernization and Tradition (New York: Paragon House, 1993), 146-47.

[86] David Mussington, Arms Unbound: The Globalization of Defense Production (Cambridge: Center for Science and International Affairs, 1994), 49.

[87] Dreyer, China's political System, 147.

Table 3.1. PRC Graduate Study; Engineering Graduates, 1952-87

EDUCATION: GRADUATE LEVEL ENGINEERS	
YEAR	Number of Graduates (in 1000s)
1952	10.2
1957	17.2
1965	80.3
1978	56.5
1980	44.2
1981	12.2
1982	172.2
1983	111.4
1984	97.5
1985	97.7
1986	119.2
1987	156.1

Source: Colin Mackarras and Amanda Yorke, The Cambridge Handbook of Contemporary China (Cambridge: Cambridge University Press), Table 10.11, p. 224.

Post Mao-era goals emphasized reduced yield to be achieved by miniaturization, and diversification of the arsenal. This was achieved through internal alliance building. The offshoot of TNWs was a byproduct of the diversification. These weapons were produced prior to the development of a doctrine of usage.

E. ANALYSIS/SUMMARY

Though the Chinese state's commitment to science and technology development was firmly set from the very beginning — since the 1950s research institutes had been established in five sectors — the industrial military complex forced a large proportion of China's scientific manpower to be devoted to defense R&D, especially the nuclear program, leaving only a limited amount of resources and

national investments available to civilian science and technology. The impressive achievements of the nuclear and space program resulted from the allocation of scarce and critical resources to the project.[88] The best scientists, research facilities and funding were channeled into the production of high-priority projects, one of which was the development of TNWs. Thus, Yeu-Farn Wang argues, there was an immoderate prejudice toward military-related industry and development.

> The priority given to those areas, once begun, tended to perpetuate itself via bureaucratic inertia; factions in the bureaucracy associated with defense and heavy industry wielded powerful influence and were able to protect and enhance their share of the budget, and of essential raw materials. As a result, the defense establishment enjoyed plentiful allocation of resources and had a strong influence on the general policy agenda. The military-industrial bias caused serious sectoral imbalance in China's overall development, and this institutional legacy created thorny problems for China's reform programs in the 1980s.[89]

The focus of this chapter has been to research the role of TNWs in the evolution of the LTS. The method used was the evaluation of the social and technological growth of the system. This methodology, formally known as SCOT, has been extremely revealing in the discovery of how the LTS altered its path to diversify midstream.

During the interim between the death of Mao Zedong and the rise of Deng Xiaoping, the LTS not only survived, it thrived. The phenomenon is due to linkages that were made between the LTS and important sectors of society. On each level of analysis, the LTS developed critical connections prior to its transformation as Mao's life waned. It was founded and directed by influential figures from the revolutionary struggle. The LTS was able to endure several poor economic and social programs

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[88] Yeu-Farn Wang, China's S&T, 95.

[89] Yeu-Farn Wang, China's S&T, 96.

which could have dismantled the system in a manner that foreign assistance and intelligentsia were dismantled. The LTS was stronger than these social entities.

When brought under political questioning, the LTS survived by earlier positioning of influential people in important positions. The organization, led by the CMC, was the dominant factor in politics during the latter years of Mao and the early years of Deng. During this period the strategies changed based on the experiences and differences in personalities of the leadership. The LTS took this opportunity to transform itself. It began to diversify, introducing TNWs, atomic land mines and neutron weapons. The effects of this transformation affected the international community and the military doctrines of the PLA.

Since the international community, especially regional neighbors, reacted differently to the evolution of the system, the prestige factor could not be seen as the sole driving factor in the development of the LTS during this period. Threat too, had been discounted as an exclusive driver for the development of TNWs during this time, partially due to the shifting alliances in the international system. The Soviet Union remained the primary threat to China's security throughout this period. Chinese leadership had no reason to alter the development of large weaponry. However, since the introduction of TNWs appeared prior to the development of a military doctrine for their usage, the compelling reason for the development of these weapons is very likely the technological driver.

This story ends where another begins. If the start of TNW development was driven by technology, then why did the PRC suddenly reduce high production rates at the end of the cold war? It would seem the technological linkages would grow more durable. The answer is rooted in threat reduction. Deng's perception of the importance of TNWs changed Economic and national security concerns play larger roles than technological growth. These and other questions will be evaluated in the next chapter.

IV. THE CAPPING OF TNW PRODUCTION

A. INTRODUCTION

After building a large technological system (LTS) capable of producing several nuclear warheads annually, the focus of development seemed to shift. Heretofore, technological influences on development have led to the expansion and diversification of the nuclear program.[90] The Chinese nuclear system was characterized by its ability to command high percentages of the national resources. Indeed, technical artifacts were produced for which the PLA was not prepared to exploit fully.[91] Regional military training was mandated to teach battalion commanders to utilize these modern weapons effectively.[92] As the PLA created the doctrines to effectively employ these weapons, production rates began to wane. This chapter explains how momentum was lost in the LTS, causing TNW production to reach its asymptote.

The momentum of the LTS was affected by external and internal changes. Also, this period was characterized by alterations in the international system which were difficult to predict. The Cold War ended abruptly. Many states were taken by surprise at the rapid demise of the Soviet Union. Security calculations had to be recomputed. China suddenly found that it could no longer drive its modernization policy by viewing itself as the crucial third leg upon which international stability during the Cold War rested. Deng Xiaoping realized early that the future of China's

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[90] This thesis argues that the development of China's nuclear arsenal can be separated into three distinct phases with the following characteristics. Chapter II discusses the technological driven phase. This chapter examines changes which caused threat to become the dominant driver for TNW development.

[91] TNWs originated in the mid-1970s, as discussed in Chapter III of this study. The earliest exercises were conducted in the early 1980s.

[92] Training on the use of TNWs was conducted by many of the military regions. By 1984, nine of eleven military regions had participated in exercises involving the offensive and defensive use of TNWs. See Chong-Pin Lin, China's Nuclear Weapons Strategy: Tradition within Evolution (Lexington, Mass.: Lexington Books, 1988), 92-94.

prosperity rested not only with the strength of its military might, but more important, with the combined power of all of its resources — particularly, the strength of its economy. This change in strategic vision created internal wedges between the established sectors of the society, namely the political leaders and the LTS. Political linkages and internal alliances were weakened and broken. The direction of the LTS was drawn fully under the control of the nation's leadership.

This chapter completes the description of tactical nuclear weapon development in China. It explains the reduction of TNW production using the technological model. The contribution of TNWs to the People's Liberation Army (PLA) defense structure is discussed. This chapter also introduces important trends in ongoing major international treaty negotiations, from the Chinese political perspective on the utility of TNWs.

This chapter is divided into sections which describe the influences affecting TNW development. The first section updates the capabilities of the Chinese nuclear arsenal, with particular emphasis on TNW systems. The next section describes organizational changes which altered the control of resources. These patterns weakened the LTS. The following section discusses the difference in perspective between the PLA and political leadership. The chapter concludes with an analysis of the technology driver as an explanatory tool for this period of TNW development.

B. STATUS AND TRENDS IN THE TRIAD

Chinese tactical nuclear capabilities have grown since the mid-1970s. The capabilities of the nuclear arsenal must be estimated due to limited information provided by the PRC. Norris estimates that the Chinese nuclear arsenal contains 300 strategic nuclear weapons, complemented by an additional 150 TNWs that are available, but not deployed.[93] The Chinese have the ability to deliver these nuclear

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[93] Robert S. Norris, Andrew S. Burrows, and Richard W. Fieldhouse, Nuclear Weapons Databook, vol. 5, British, French, and Chinese Nuclear Weapons (Boulder, Colo.: Westview Press, 1994), 358.

weapons via a number of systems categorized as submarines, bombers, and missiles. Submarines are capable of delivering strategic nuclear weapons only. Bombers and missiles can deliver strategic or tactical nuclear weapons.

1. Submarines

Submarine-launched weapons are either conventional or strategic nuclear delivery systems. The conventional ordnance is delivered predominantly by the aging fleet of diesel-powered submarines. Nuclear missiles can be launched from the two Xia-class nuclear-powered submarines, or from the Chinese-assembled, Golf-class, diesel-powered submarine.[94] These North Sea fleet vessels are capable of launching the two-stage JL-1 submarine-launched ballistic missile. The JL-1 is a strategic nuclear weapon delivery system which is expected to be supplemented or superseded by the JL-2, which is under development. The JL-2 adds minimum throw weight but significant range improvement to the JL-1 by virtue of an additional rocket motor stage. The JL-2 is expected to enter service in the mid to late-1990s.[95]

2. Aircraft

Similar to the submarine force, the bomber force is capable of delivering conventional and strategic nuclear weapons. However, unlike the submarine force, the bomber force also plays a tactical nuclear role. According to Norris, the bomber leg of China's triad is deployed at regular air bases with routine rotations to contingency bases.[96] These aircraft units deploy with nuclear armaments from the

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[94] See John Wilson Lewis and Xue Litai, China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age (Stanford, Calif.: Stanford University Press, 1994), passim.

[95] Norris, Nuclear Weapons Databook, 396-7.

[96] Norris, Nuclear Weapons Databook, 375.

central arsenal for tactical use.[97]

> Nuclear gravity bombs for tactical use are presumed to be deployed with and under the control of the Air Force; these may be part of the overall bomb stockpile.[98]

However, there is little evidence that these weapons are warehoused by the leaders in the several military regions. *Washington Post* columnist Jack Anderson quotes a Defense Intelligence Agency (DIA) report as saying:

> Only one national stockpile site and no regional sites have been observed in China. Thus, if nuclear weapons for air delivery are deployed to air bases, they have been effectively hidden.[99]

These aircraft have combat ranges from 400 to 3,100 km, and are capable of delivering nuclear ordnance with yields between 10 kT and 3 Mt.[100] Norris adds that acquisitions of Su-27 bombers could be utilized in a nuclear role, as well as Iraqi Su-24 Fencers and Mig-29 Fulcrums, held in Iran after the Gulf War.[101] The missile force is capable of delivering nuclear weapons at greater ranges and yields; however, these systems are engineered for strategic and tactical roles.

3. Missiles

Chinese missile forces can deliver conventional and nuclear weapons for tactical or strategic use. Nuclear warheads yield ranges from tens of kilotons to 5

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[97] J. Mohan Malik believes that China has 110-150 nuclear-capable aircraft: B-5, B-6, and Qian-5-5. Recent efforts to modernize the PLA(AF) using American and West European technological assistance, have suffered due to sanctions imposed after the 1989 Tiananmen square massacre. See J. Mohan Malik, "Chinese Debate on Military Strategy: Trends and Portents," Journal of Northeast Asian Studies 9, no. 2 (Summer, 1990): 6.

[98] Norris, Nuclear Weapons Databook, 375.

[99] As cited in Norris, Nuclear Weapons Databook, 375, from Jack Anderson, "China Shows Confidence in Its Missiles," Washington Post, 19 December 1984, pg. F11.

[100] Norris, Nuclear Weapons Databook, Table 1.7, pg. 11.

[101] Norris, Nuclear Weapons Databook, 373.

Mt.[102] The strategic nuclear missiles in the current arsenal are the DF-3/3A, DF-4, DF-5/5A, and DF-21/21A.[103] The extended range of these multistage missiles enables China to reach targets deep into any potential adversary's territory, including the United States. The DF-41 is assumed to be deployed in the first decade of the next century.[104] This three-stage missile is designated to replace the two-stage DF-5, enabling placement of multiple independently targetable reentry vehicles (MIRVs) on an intercontinental missile.[105] Additionally, Chinese missile forces have been diversified with the introduction of a new family of tactical missiles capable of carrying conventional or nuclear weapons. There are four missile types in the M-family — M-7, M-9, M-11 and M-18.[106] The internal version, designated DF-15, may not be nuclear armed. However, its 500-kg payload is capable of delivering a conventional high explosive or 90 kT nuclear warhead.[107]

Therefore, the PRC maintains a nuclear triad of submarines, bombers, and missiles. Two legs of this threesome can be used in tactical roles — aircraft and missiles. Reportedly, there are additional tactical systems such as: atomic demolition mines, enhanced radiation weapons and nuclear artillery pieces.

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[102] Data compilations on the yields of various weapon systems are available in "The Military Balance," London, 1990-94; Jane's Strategic Weapon Systems, 1985-96; et al.

[103] The DF-1 was a liquid oxygen fueled missile which did not have a nuclear role. The DF-2 was retired in the late 1980s. See Norris, Databook, 362; and Military Balance, 1989-1990 (London: IISS, 1989), 145.

[104] Norris, Nuclear Weapons Databook, Table 1.7, pg. 11. There is an estimate that the DF-41 will enter service in 1997. See the "Offensive Weapons Tables" in Duncan Lennox, ed., Jane's Strategic Weapon Systems (Surrey, UK: Jane's Information Group), unpaginated. According to Holly Porteous, the DF-41 is a mobile, 12,000 km missile, which can deliver 500-700 kg warheads with yields of 200-300 kT. See Holly Porteous, "China's View of Strategic Weapons," Jane's Intelligence Review 8, no. 3 (March, 1996):135.

[105] Eric Arnett sees no sign that Chinese weapon designers made significant progress in 1994 on the new guidance systems required to improve accuracy of China's strategic ballistic missiles or to arm them with MIRVs. See Eric Arnett, "Military Technology: The Case of China," SIPRI Yearbook 1995: Armaments, Disarmaments and International Security (Oxford: Oxford University Press, 1995), 359.

[106] See descriptions of these nuclear-capable missiles in Chapter II.

[107] Lennox, Jane's Weapon Systems, CSS-6, unpaginated.

According to Chong-Pin Lin, the army, navy and air force may have received TNWs as early as 1976. In the army, about 400 203mm guns with 5-kT nuclear warheads and some 700 152mm guns with 1-kT nuclear warheads were distributed in 90 artillery battalions under 20 field artillery divisions, stationed along the Sino-Soviet border. An independent hierarchy, attached to the field artillery divisions, commanded tactical nuclear artillery forces. Various surface-to-air missiles could carry 1-2-kT warheads. In the navy, 20-kT warheads were available for naval surface units. Ten kiloton bombs were available for delivery by the air force's F-9 fighter bomber.[108] Chong-Pin Lin adds that enhanced radiation weapons were considered strongly. According to Chong-Pin Lin, the evidence is a number of articles published in scientific journals and several low yield tests.[109] The continued development of these weapons is of interest to the PLA, discussed later. However, the political leadership viewed the utility of these weapon systems differently. During the 1980s, Deng's vision for China's development changed due to alterations in the international system. These changes and their effect on the LTS are discussed next.

C. DENG XIAOPING'S REVISED STRATEGIC VISION

Deng Xiaoping was the most influential figure in the development of China's nuclear arsenal by virtue of his long leadership over the program, his tenure in leadership, and the influence of his personality.[110] Deng established political linkages

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[108] Chong-Pin Lin, China's Nuclear Weapons Strategy, 88-9.

[109] Articles appeared in *Kexue Shinian* (Scientific Experimentation) and *Hejishu* (Nuclear Technology). See Chong-Pin Lin, China's Nuclear Weapons Strategy, 89. From 1975 to 1993, China conducted 22 tests. Approximately fourteen are estimated to be less than or equal to twenty kiloton blasts. Fifteen were conducted underground. Since 1982, all nuclear tests have been conducted underground. See Norris, Nuclear Weapons Databook, Appendix 3, 421.

[110] As Communist party General secretary, Deng appointed Nie Rongzhen to head the nuclear program in 1956. Two years later, Deng personally approved sites for construction of major weapons facilities. From 1982-3, Deng was elected to chair the PRC and CCP CMC, the most powerful decision making bodies concerning nuclear weapon development. Although retiring from those positions in 1989, Deng still wields decision making power concerning program development. See Norris, Nuclear Weapons Databook, 344.

and broke others which affected the momentum of the LTS. Deng's pragmatic personality came into play when he made decisions which changed the course of TNW development. These decisions were based upon the changed international environment, and Deng's modified domestic perspective.

1. International System Changes

Deng Xiaoping's strategic vision shifted due to the Sino-Soviet warming, and his intention to move China further into the community of nations. The Sino-Soviet warming began at the funeral of Konstantin Chernenkyo in 1985. Minister Li Peng met with Mikhail Gorbachev after this funeral and indicated that there may be room for closer relations between the two countries.[111] This closing of ties coincided with a 1984 threat assessment conducted by the CMC. The results of this study indicated that China would not be in another major war for at least the next 50 years.[112] This perception of a reduced threat led Deng to make institutional changes which affected the PLA and the LTS. Also, Deng's decision to incorporate China into the community of nations had adverse effects for the PLA and the momentum developed for the LTS.

Deng Xiaoping moved China into the mainstream of arms control and disarmament by joining several important international organizations and arms control regimes. These actions further reduced China's threat environment. China's entry into the Missile Technology Control Regime (MTCR), NPT, and negotiations for the Comprehensive Test Ban Treaty (CTBT), marked a trend for reduced utility of

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[111] Colin Mackerras and Amanda Yorke, The Cambridge Handbook of Contemporary China (Cambridge: Cambridge University Press, 1991), 43.

[112] Lewis, China's Strategic Seapower, 100.

TNWs.[113] China's focus on nuclear nonproliferation may have affected factory level TNW production. Some defense industries converted from nuclear to conventional weapon production for two reasons — financial and political. First, nuclear weapons are less profitable than conventional weapons. Nuclear weapons are more costly to produce and the demand is low. These systems cannot be sold to nonnuclear weapon states. Therefore, companies manufacturing nuclear weapon systems must deliver these armaments to one consumer, the PLA. Conversely, conventional weapons are easier to produce and distribute. Additionally, portions of the profit gained by the sale of these arms are maintained by the defense construction establishment. This extra income supplements reduced military expenditure. Nuclear weapons production is not only financially undesirable. It is also politically unpalatable.

China's participation in arms control and disarmament regimes may have affected TNW production. CTBT negotiations influence the development of all PRC nuclear weapons; however, TNWs are affected more. Negotiations on the CTBT are likely to prevent further modernization of TNWs due to the zero-yield, nuclear testing limit. If only a few tests are available, scientists are likely to use these research opportunities to modernize primary weapon systems — strategic nuclear weapons, not secondary systems — TNWs. Therefore, CTBT negotiations have made strategic nuclear weapons relatively more important than TNWs. PLA views differ from the political leadership on this point. This dichotomy, which affects TNW production, is explored later in this chapter.

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[113] China became a member of the IAEA in 1984, acceded to the NPT in 1992, and has observed the restrictions of the MTCR since 1994. Currently, China has been accused of violations of the MTCR due to alleged transfers of M-9 missiles to Pakistan. See Leonard Spector, Mark McDonough, and Evan Medeiros, Tracking Nuclear Proliferation: A Guide in Maps and Charts, 1995 (Washington D.C.: Brookings Institution, 1995), 49 and 185-6. China has neither signed the 1963 partial test ban, nor observed the 1992 moratorium on nuclear testing. China and France continue to test until the Comprehensive Test Ban Treaty, expected to be agreed upon in late 1996.

2. Domestic Prosperity Focus

Deng Xiaoping lowered military modernization as a priority in China. Savings were transferred to other sectors.[114] Economic progress which will lead China into the fastest growing region and by some accounts the leading economic power in the 21st Century.

This shift of resources from military research and development to other sectors indicates a long-term focus on the economy. Military spending is used for short-term gains which satisfy the immediate needs and objectives of the government. Few, if any, of these investments, build capital which serves the long-term needs of the nation. Therefore, we see a weakness in the ability of the LTS to command resources. The LTS must shift its production emphasis to its top priority — building strategic nuclear weapons.[115]

Deng Xiaoping made institutional changes which affected the momentum of the LTS. He eliminated dual posts in the party and the military. No longer could a high ranking CCP member hold equally high positions in the PLA. This separation of civilian and military entities had a twofold effect on weakening the LTS. First, political authorities were not compelled to lobby for resources for the sake of a program which they headed. Therefore, the pattern of funding which existed under Marshal Nie Rongzhen was abolished.[116]

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[114] The four modernization areas are: agriculture, industry, science and technology, and military. Modernization of the armed forces is viewed as a supporting element of the three higher priorities. Amidst resistance from production ministries, the number of major military research and development projects were cut from thirty-five to twenty during these reforms. COSTIND, China Today: Defense Science and Technology (Beijing: National Defense Industry Press, 1993), 890-92.

[115] Even strategic nuclear weapon production seems to have tapered off due to this transformation. See Norris, Nuclear Weapons Databook, 374, and Table 7.1, p. 359.

[116] Jiang Zemin is the first to regain this dual leadership since Hua Guofeng. This may mark a reestablishment of this dormant political linkage. However, it will not be as powerful until Deng passes.

Second, this separation lowered the PLA's status in society. The military focus of decisions was removed. Now there was a clear separation between the political hierarchy and those who were commanded, the PLA. By lowering the PLA, the LTS was lowered in stature, for military research and development is directed by the PLA. A reduction in LTS influence over resources leads to reduction in the production of TNWs.

D. PLA PERSPECTIVE

The PLA has seen these transformations differently. It appears that the TNWs are more important to the defense of the Chinese mainland due to the shift in force structure. Deng's revised strategic vision incorporated a reduction in manpower of approximately one million men. With this weakening,[117] the PLA requires TNWs even more so to repel invaders. Alastair Johnston records that TNWs are required to repel successfully conventional and nuclear invasions.[118]

TNWs are useful for fighting high-tech adversaries such as the United States, Russia, and Japan. The Gulf War and the Falkland Island war were excellent examples of how superior technology can deliver rapid victory in limited wars. TNWs may enable a less technologically capable force to level the playing field with a high-tech foe during combat.

From trends in development, it appears that the PLA has been unable to convince leadership to adopt its viewpoint on TNWs. This is partially due to Deng's weakening of the PLA voice. Military reorganization and institutional changes have

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[117] The long-term view of military reforms is that the PLA was modernizing during this period. However, the short-term effect of this reduction of manpower is a weakening of the army. Manpower was an essential component to defending China against invasion. Consequently, the unique capabilities of TNWs would restore this loss of combat capability to the PLA.

[118] Alastair Johnston, "China's New 'Old Thinking,'" International Security 20, no. 3 (Winter 1995/1996): 28.

prevented PLA perspectives from dominating opposing views at the highest level of decision making in the PRC.

E. CONCLUSION

The reduction in threat caused the capping of China's tactical nuclear arsenal. The changed strategic environment and the refocussing on domestic prosperity caused Deng Xiaoping to make decisions which weakened the LTS. Once weakened, the LTS reverted to its primary responsibility — the production of strategic nuclear weapons. TNWs were held in lower regard by political authority. The military did not share this viewpoint. They argued that TNWs were more important for combat due to the downsizing of active forces, and the difference in capabilities between high-tech forces and the PLA. These disagreements failed to convince political leaders because the linkages of influence were weakened and broken. This phenomenon adversely affected the LTS because of its subsidiary role to the PLA. The momentum of the LTS has slowed tremendously. The decision- making ability of lower echelons was severed, resulting in a capping of TNWs in the late 1980s.

The changed strategic environment and the refocussing on domestic prosperity caused Deng Xiaoping to make decisions which weakened the LTS. Once weakened, the LTS reverted its efforts to its primary responsibility, the production of strategic nuclear weapons. TNWs were held in lower regard by political authority. The military did not share this viewpoint. They argued that TNWs were more important due to downsizing of active forces, and the difference in capabilities of high-tech forces and the PLA. These disagreements failed to convince political leaders becasue the linkages of influence were weakened and broken. This phenonenmon adversely affected the LTS, because of its subsidiary role to the PLA. The momentum of the LTS has slowed tremendously. The decision making ability of lower echelons was severed, resulting in a capping of TNWs in the late 1980s.

In summary, the reduction of threat undermined the technolgy driver. Reduced resources restricted TNW developemtn despite PLA desres. Clearly, the political leadership excercised comand over the development of all aspects of the nuclear arsenal — specifically, TNWS.

V. CONCLUSION

A. FINDINGS

This thesis has traced the development of China's TNW program. It argues that TNW production can be explained, in part, by technology. The main findings are presented in this chapter. Next, the implications for U.S. foreign policy are discussed. Finally, the future of TNW development is predicted.

MAIN FINDINGS		
Hypothesis	Period I (1972-79)	Period II (1983-93)
TNW Development Driver	Technology	Reduced Threat
Strategic Planning	Bottom Up	Top Down

The main findings of this study are summarized in the above matrix. During the first analysis period of TNW development, technology drives the introduction of PRC TNWs. This driver appeared to be dominant with the exception of a short period. During the 1968-1969 period, Sino-Soviet tension reached an apex. The threat of a Soviet invasion, using heavy tanks, seemed probable. Nuclear weapons were considered as an option to defeat Soviet advances. The PLA planned to use nuclear bombs in rear areas of the Soviet formations. These nuclear attacks would cause the invading forces to be enveloped by nuclear attack in the rear, and by conventional forces forward. There is insufficient open-source evidence to conclude TNWs were developed explicitly due to the Sino-Soviet confrontation. However, as discussed in Chapter 3, it is plausible that the decision to build TNWs originated at the research and development level, not at the political leadership level.[119] The

[119] The political leadership desired to develop TNWs in the late 1950's and early 1960s; however, limited resources forced leaders to build exclusively strategic weapons for the nuclear arsenal development. The governmental aspiration for TNWs was not fulfilled. The PRC nuclear strategy evolved around the capabilities of strategic nuclear weapons, causing the bureaucratic desire for TNWs to become dormant. However, as

decision to develop TNWs for use on the battlefield was implemented during the 1970s.

During the second period of analysis, technology is no longer the dominant driver. The reduction of threat perception drove political decisions which led to the capping of TNWs. Chinese leaders discerned a more benign environment. Security requirements eased as threats were reduced. Actions were taken to promote economic prosperity during this time. Institutional changes were implemented which reduced the momentum developed by the LTS during the first period. Consequently, the LTS was unable to command resources effectively. This change caused the momentum of the LTS to weaken. Therefore, the LTS reverted to its primary role of developing strategic nuclear weapons, causing TNW production to level off. The political hierarchy exercised complete control over the nuclear arsenal. The implications of these changes are discussed next.

B. IMPLICATIONS

Militarily, China appears to require the use of TNWs for defense against an invasion and to achieve favorable results when battling high-tech adversaries. This view is not held by the PRC leadership. China seems to be aligning itself with major international movements. Therefore, the following observations are made with respect to U.S. foreign policy:

1. *Continue arms control and disarmament efforts.* These could lead to further reductions in TNW levels. The pressures for reduction in nuclear arsenals and for prevention of the spread of nuclear weapons technology to non-nuclear weapon states are growing. It appears that China feels this pressure and is changing its defense industry. However, it is likely that China will not be limited by technology significantly due to the conversion of the defense industry. The

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resources were channeled into the nuclear program, a momentum was developed which resulted in the diversification of the arsenal. I argue that designers developed TNWs from the technological research into miniaturization of the strategic nuclear weapons. Therefore, the decision to develop TNWs originated from the scientific level, not the political level. TNWs were developed in the mid 1970s.

facilities which produce military armaments continue to manufacture weapon systems; therefore, if the focus returns to nuclear weapons, TNW systems can be expected to be more advanced than those currently fielded.

2. *Remain Engaged.* The emphasis on engaging China politically, militarily,[120] and economically reduces PRC perceptions of a threat from the United States. Lower threats, coupled with political stability, appear to have a mediating effect on TNW production. We can expect to see fewer weapons due to attrition and low production if this stance is maintained.

3. *Resolve the Taiwan issue.* Communicating support, tacitly or explicitly, for a Taiwanese independence movement could trigger a return to TNW production. TNWs have great military utility in this type of skirmish. The PRC considers the use of TNWs on its own territory not a violation of the "no first use" policy. Additionally, if this hypothetical independence movement is backed by the United States, the use of TNWs would be essential to leveling the gap in technology between these military forces. In the future, enhanced economic resources and increased technological capability may enable the PRC to field an advanced TNW arsenal. Therefore, the immediate resolution of this issue is necessary.

C. SHAPE OF THINGS TO COME

The development of China's TNWs is not limited significantly by technological constraints. If the political hierarchy chooses to develop a large TNW arsenal, material and technical resources will be available. However, military trends appear to be toward capable conventional systems, employing stable solid propellants, terminal guidance packages, and improved electronic architecture. Conventional weapons do not carry the negative political connotations which hamper nuclear weapons. These systems are less expensive and are easier to modernize.

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[120] Here military engagement means the contact and exchange of ideas between U.S. armed forces and the PLA. Examples are: officers attending military academies of the other country; military exercises; and high ranking military officials visiting military installations in the other country. It does not imply hostile actions. Currently, this segment of U.S. engagement is comparatively ineffectual to the others mentioned. However, improvement in this area would balance U.S. efforts at engagement, resulting in a reduced sense of threat between the two countries.

Holly Porteous states that PRC strategists are considering arming strategic missiles with conventional warheads. These weapons could be used to suggest the possibility of a successful nuclear counterattack to an adversary while avoiding escalation.[121] The same applies for tactical systems such as the M-9 missile, which was demonstrated in March 1996. If these exercise missiles carried nuclear weapons, then the scenario would have been catastrophic for the independence forces and their allies. Therefore, these conventional armaments may have a political, as well as military, role.

Eric Arnett argues that economic reforms will hamper further indigenous military technological growth. Foreign assistance will not remedy the problem due to China's poor assimilation practices.[122] As long as threat perceptions are low, and the central government maintains control over nuclear arsenal development, military research and development resources will be constrained. These restrictions, coupled with trends toward conventional deterrence, will stifle TNW production.

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[121] Holly Porteous, "China's View of Strategic Weapons," Jane's Intelligence Review 8, no. 3 (March, 1996): 135. This principle also applies to tactical systems which would be more useful in thwarting a U.S.-backed, independence movement in Taiwan. This distinguished analyst considers the possibility of a nuclear strike on Taiwan inconsistent with long term PRC goals for this island. Interview with Holly Porteous, April, 1996.

[122] Eric Arnett, "Military Technology: The Case of China," in SIPRI Yearbook 1995 (Oxford: Oxford University Press, 1995), 359-86.

APPENDIX

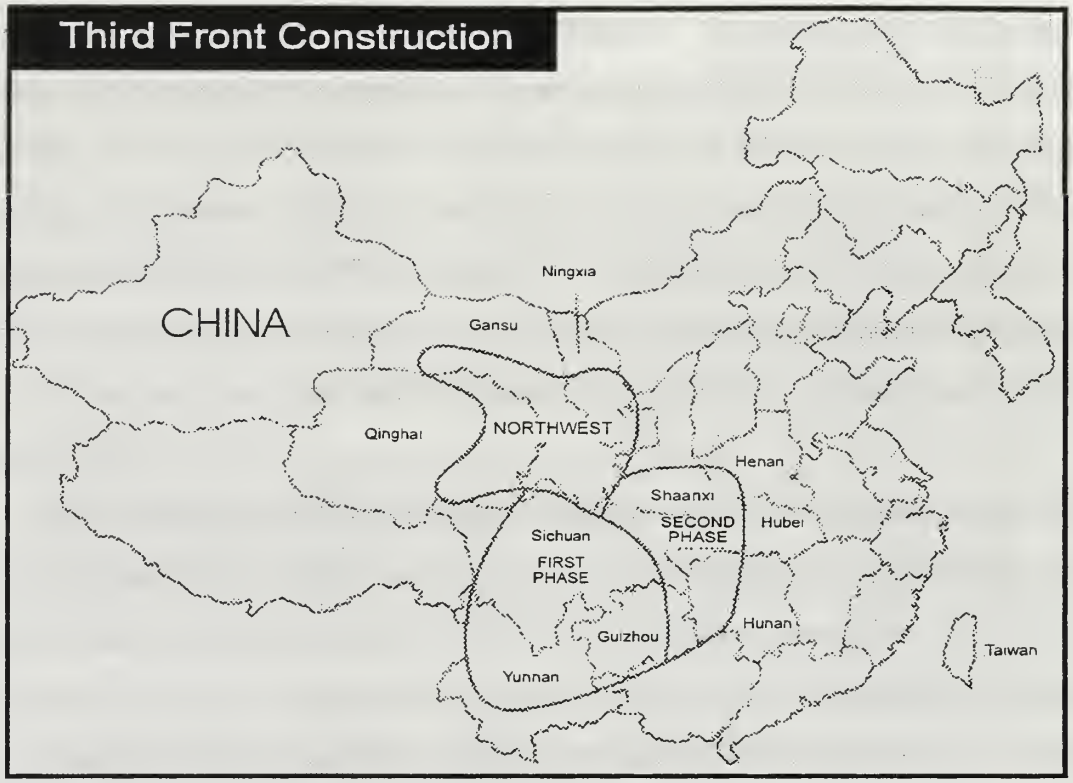

Figure 3.1: Third Front Construction

Source: Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," The China Quarterly No. 115 (September 1988): Figure 1, pg. 354.

Third Front Capital Investment
(Selected Regions)

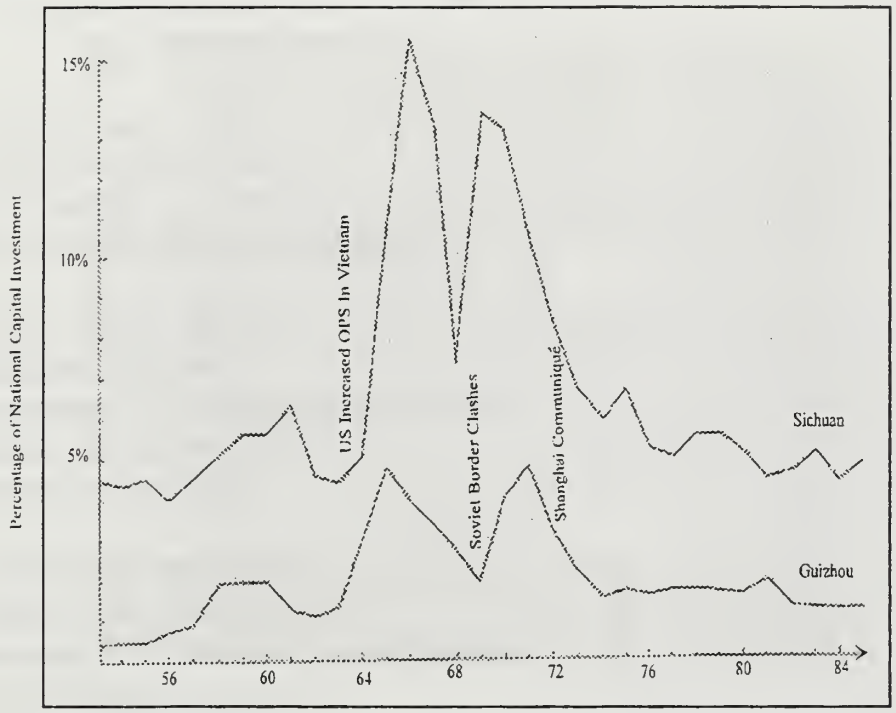

Figure 3.2: Capital Investment

Source: Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," The China Quarterly No. 115 (September 1988): Figure 3, pg. 362.

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